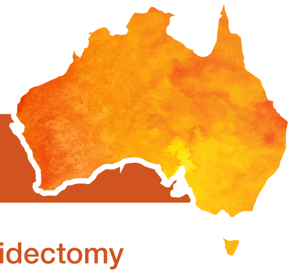
# Chapter 3
# Thyroid investigations and treatments



## At a glance

### Thyroid function testing

Measuring thyroid stimulating hormone (TSH) is recommended as the single first-line test for possible thyroid dysfunction. More comprehensive tests of thyroid function – TSH plus free tri-iodothyronine (T3) and/or free thyroxine (T4) – are recommended only if TSH is abnormal or for investigation of certain conditions. The rate of thyroid function testing has increased in Australia, faster than the rate of population growth. The fast growth and high rate of thyroid testing in Australia suggest that there is over-testing.

The Atlas found that, in 2016–17, 5.5 million TSH tests and 2.3 million thyroid function tests (TSH plus T3 and/or T4 ) were ordered in Australia. This is likely to be an underestimate of testing rates, because of the way data are captured.

Improved policies for collecting Medicare Benefits Schedule data would allow a better understanding of publicly funded thyroid function testing across Australia.

### Neck ultrasound and thyroidectomy

Neck ultrasound can be used to investigate suspected disease of the thyroid gland, including the examination of thyroid nodules (or lumps) for possible cancer. One of the reasons for thyroidectomy (removal of the thyroid) is to treat malignant thyroid nodules. Some small thyroid cancers (thyroid papillary microcarcinomas) have a very low risk of harm if left untreated. The benefit to patients of detecting and managing these is unclear.

The Atlas found that the rate of neck ultrasound varies up to six-fold, and the rate of thyroidectomy varies up to five-fold, between local areas in Australia. Underlying patterns of disease are unlikely to fully explain the variations seen.

Australia and other developed countries have seen a substantial rise in thyroid cancer incidence in the past three decades. In some developed countries, this rise has been clearly driven by increased detection and investigation of small, low-risk thyroid cancers, which has led to a rise in thyroidectomy. Although detection of more small, low-risk thyroid cancers does not fully explain the rising incidence of thyroid cancer in Australia, experiences from other countries highlight the importance of ensuring appropriate use of ultrasound for investigating the thyroid, and thyroidectomy.

## Recommendations

### Thyroid function tests

3a. The Medicare Benefits Schedule (MBS) Review Taskforce to advise on how the data collected by the MBS could provide clinically meaningful information to allow regular audit and feedback to clinicians on the appropriateness of use of tests, as well as accurate public reporting on use of healthcare resources. In relation to thyroid function tests, the taskforce could advise on:

- i Changes to rules related to data suppression due to provider confidentiality and changes to reporting of episode coning*
- ii Creating an MBS item specific for ultrasound investigation of the thyroid.

### Neck ultrasound

3b. Relevant colleges and clinical societies to agree on a nationally consistent approach to providing standardised, high-quality thyroid ultrasound reports, such as using the ATA (American Thyroid Association) guidelines or the TI-RADS (Thyroid Imaging Reporting and Data System) score to support general practitioner decision-making and help reduce unnecessary repeat ultrasounds.

* Episode coning in the MBS means that when more than three tests are requested by a general practitioner (GP) per patient attendance, benefits are paid only for the three tests with the highest fees. If a GP requests a test with three other more expensive tests, it is 'coned out' and may not be included in the MBS dataset.

# 3.1 Thyroid function testing

## Thyroid stimulating hormone tests

## Thyroid function tests

### Why is this important?

The number of people having thyroid function testing in Australia has increased faster than the rate of population growth. Between 2012 and 2017, the number of people with Medicare Benefits Scheduled (MBS) claims for thyroid function testing increased by 5.7% per year, compared with 1.6% per year growth in the population.[1,2] The fast growth of thyroid function testing in Australia suggests that there is over-testing.

Measuring thyroid stimulating hormone (TSH) is recommended as the single first-line test for possible thyroid dysfunction.[3] Thyroid function tests (TFTs) – measuring TSH plus free tri-iodothyronine (T3) and/or free thyroxine (T4) – are recommended only if TSH is abnormal or for investigation of certain conditions.[3]

### What did we find?

The ability to examine variation in thyroid function testing is restricted by episode coning* (a funding arrangement that applies to MBS data), and MBS data confidentiality requirements.

In 2016–17, 5.5 million TSH tests and 2.3 million TFTs (TSH plus T3 and/or T4) were recorded in the MBS dataset in Australia. The data do not capture the full extent of testing in the community because of episode coning. The Atlas found the rates of both TSH tests and TFTs vary up to about three-fold between local areas in Australia. This is likely to be an underestimate of the true variation across Australia, due to the impact of confidentiality rules on reporting.

### What can be done?

Improved policies and arrangements for collection and reporting of MBS data would allow a better understanding of thyroid function testing across Australia. The appropriateness of testing and the benefits gained from these tests could be increased by audit and feedback to clinicians on requesting of tests; increasing access to previous test results with a central repository; changing protocols for further laboratory testing after an initial TSH measurement; and educating general practitioners and consumers.

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* Episode coning is a funding arrangement that applies to some MBS pathology items; data confidentiality requirements are rules for protecting the confidentiality of patients and providers. See 'About the data' for more information.

# Thyroid function testing

## Context

This section includes data on the use of thyroid function testing in adults. It examines two items:

- Thyroid stimulating hormone (TSH) tests: TSH alone[†]
- Thyroid function tests (TFTs): TSH in combination with free tri-iodothyronine (T3) and/or free thyroxine (T4).

These tests are used to diagnose thyroid dysfunction, such as hypothyroidism (underactive thyroid) and hyperthyroidism (overactive thyroid), and to monitor the response to treatment. They are also used to monitor patients taking other medicines that affect thyroid function.[3]

Thyroid dysfunction is common; the prevalence of hypothyroidism is 3.1% to 5.6%, and the prevalence of hyperthyroidism is 0.4% to 1.3%, in the adult population.[4-6] Thyroid function testing can be used to investigate common problems that may indicate underlying thyroid disease, such as unexplained weight change, fertility problems, menstrual changes, goitre, depression and anxiety, as well as non-specific symptoms such as tiredness.[3] Thyroid function testing may also be performed as part of investigations for older patients with symptoms of dementia or other behavioural changes. The most common reasons for Australian general practitioners (GPs) to request thyroid function testing are hypothyroidism (13.4%) and hyperthyroidism (4.3%), weakness or tiredness (9.4%), and general check-ups (4.9%).[7]

Some variation in the rate of thyroid function testing due to differences in clinical judgement is expected.[8] Symptoms prompting investigation of thyroid disease can be non-specific and subtle.[3,9] However, population screening of asymptomatic patients for thyroid dysfunction is not recommended.[10]

Measuring TSH alone is recommended as the first-line test in most situations to investigate possible thyroid dysfunction.[3] If the TSH level is abnormal, measurement of T4 and possibly T3 may be appropriate to provide further information.[3] In some situations (for example, known or suspected pituitary disease), initial measurement of TSH plus either T3 or T4 is appropriate.[3]

The number of people having thyroid function testing in Australia has increased faster than the rate of population growth. The number of people with MBS claims for thyroid function testing grew by 5.7% per year, compared with approximately 1.6% per year growth in population, between 2012 and 2017.[1,2] GPs request the majority of TSH tests and TFTs in Australia. In 2014–15, they requested approximately 90% of TSH tests and 75% of TFTs.[1] Variation in GPs' requesting rates for thyroid tests has been noted previously, as a small number of GPs have a substantially higher rate of requesting than the average. In 2014–15, the average rate of TSH testing by GPs in Australia was 7 per 100 patients; however, a group of 310 GPs had a rate of between 40 and 173 TSH tests per 100 patients.[1]

Few directly comparable rates of TSH testing are available from other countries, but a study in the United Kingdom found that 12% of patients in a general practice had TSH testing in 2012.[8] Only 2% of the patients had an abnormal result, suggesting that testing could be better targeted without missing diagnoses.[8] Rising rates of thyroid function testing, and large variation in use, have been noted in several countries, and inappropriate requests for tests have been suggested as an important cause.[8,11] Interventions to improve the quality of requesting for thyroid function testing have also been implemented around the world.[12]

[†] Includes MBS item numbers for TSH tests that do not include testing for T3 or T4.

The MBS Review Taskforce recently recommended a number of changes to MBS items to support appropriate thyroid function testing, as well as education programs for GPs and consumers on appropriate use of TSH tests.[1] The Choosing Wisely initiative includes a Royal Australian College of General Practitioners 'Do not do' recommendation for GPs: 'Don't test thyroid function as population screening for asymptomatic patients'.[10]

## About the data

Data are sourced from the MBS dataset. This dataset includes information on MBS claims processed by the Australian Government Department of Human Services. It covers a wide range of services (attendances, procedures, tests) provided across primary care and hospital settings.

The dataset does not include:

- Services for publicly funded patients in hospitals
- Services for patients in hospital outpatient clinics where claims are not made to the MBS
- Services covered under Department of Veterans' Affairs arrangements.

Rates are based on the number of MBS-subsidised services for TSH tests or TFTs per 100,000 people aged 18 years and over in 2016–17.

Because an MBS claim is included for each service rather than for each patient, patients who receive any of the services listed in this data item more than once in the financial year will have more than one MBS claim counted.

The analysis and maps are based on the residential address of the patient recorded in the MBS claim and not the location of the service.

Rates are age and sex standardised to allow comparisons between populations with different age and sex structures.

This analysis was not undertaken by Aboriginal and Torres Strait Islander status because this information was not available for MBS data at the time of publication.

### Episode coning

MBS items for TSH tests and TFTs are subject to episode coning. Episode coning is an MBS funding arrangement that applies to GPs outside hospitals requesting multiple tests for the same patient on the same day. If more than three items are requested by a GP per patient attendance, benefits are paid only for the three items with the highest fees. The arrangement means that, if a test is requested with three other more expensive tests, it is 'coned out' and may not be included in the MBS dataset. As the MBS fee for TFTs is higher than for TSH tests, TFT data are less affected by this arrangement.

### Data suppression

For all MBS items in the Atlas, some data have been suppressed to manage volatility and confidentiality. This process takes into account the Australian Government Department of Health's requirements for reporting MBS data (see the Technical Supplement).

The process has resulted in particularly marked data suppression for MBS items for thyroid function testing. This is indicated on the maps in grey. Most local areas (Statistical Area Level 3 – SA3) were suppressed to prevent identification of the provider (practitioner or business entity). The effect of data suppression was greatest in outer regional and remote areas.

# Thyroid function testing

For TSH tests:

- Overall, 53 SA3s were suppressed, which represents 16% of all SA3s and 10% of all services
- 43 SA3s were suppressed to prevent identification of the provider
- The proportion of SA3s suppressed in each remoteness category was 7% in major cities, 24% in inner regional areas, 26% in outer regional areas and 37% in remote areas.

For TFTs:

- Overall, 79 SA3s were suppressed, which represents 23% of all SA3s and 18% of all services
- 67 SA3s were suppressed to prevent identification of the provider
- The proportion of SA3s suppressed in each remoteness category was 16% in major cities, 26% in inner regional areas, 36% in outer regional areas and 47% in remote areas.

## What do the data show?

## Thyroid stimulating hormone tests

### Magnitude of variation

In 2016–17, there were 5,539,805 MBS-subsidised services for TSH tests, representing 28,742 services per 100,000 people aged 18 years and over (the Australian rate).

The number of MBS-subsidised services for TSH tests across 287[§] local areas (Statistical Area Level 3 – SA3) ranged from 15,735 to 40,814 per 100,000 people aged 18 years and over. The rate was **2.6 times as high** in the area with the highest rate compared to the area with the lowest rate. The number of services varied across states and territories, from 20,106 per 100,000 people aged 18 years and over in Tasmania to 30,640 in New South Wales (Figures 3.4–3.7).

After the highest and lowest 10% of results were excluded and 231 SA3s remained, the number of services per 100,000 people aged 18 years and over was 1.6 times as high in the area with the highest rate compared to the area with the lowest rate.

### Analysis by remoteness and socioeconomic status

Rates of TSH tests were higher in major cities and in inner regional areas than in outer regional and remote areas. Rates were higher in areas with lower socioeconomic status in major cities, inner regional areas and outer regional areas. The pattern was less clear in remote areas (Figure 3.8).

[§] There are 340 SA3s. For this item, data were suppressed for 53 SA3s due to one or more of a small number of services or population in an area, or potential identification of individual patients, practitioners or business entities.

**Notes:**
Some of the published SA3 rates were considered more volatile than others. These rates are excluded from the calculation of the difference between the highest and lowest SA3 rates in Australia.
For further detail about the methods used, please refer to the Technical Supplement.

# Thyroid function tests

## Magnitude of variation

In 2016–17, there were 2,344,089 MBS-subsidised services for TFTs, representing 12,116 services per 100,000 people aged 18 years and over (the Australian rate).

The number of MBS-subsidised services for TFTs across 261[#] local areas (Statistical Area Level 3 – SA3) ranged from 6,425 to 16,077 per 100,000 people aged 18 years and over. The rate was **2.5 times as high** in the area with the highest rate compared to the area with the lowest rate. The number of services varied across states and territories, from 8,868 per 100,000 people aged 18 years and over in the Northern Territory to 13,866 in the Australian Capital Territory (Figures 3.9–3.12).

After the highest and lowest 10% of results were excluded and 209 SA3s remained, the number of services per 100,000 people aged 18 years and over was 1.6 times as high in the area with the highest rate compared to the area with the lowest rate.

## Analysis by remoteness and socioeconomic status

Rates of TFTs were markedly lower in remote areas than in other areas. There was no clear pattern according to socioeconomic status. Suppressed data are included in the calculation of overall rates by remoteness and socioeconomic status (Figure 3.13).

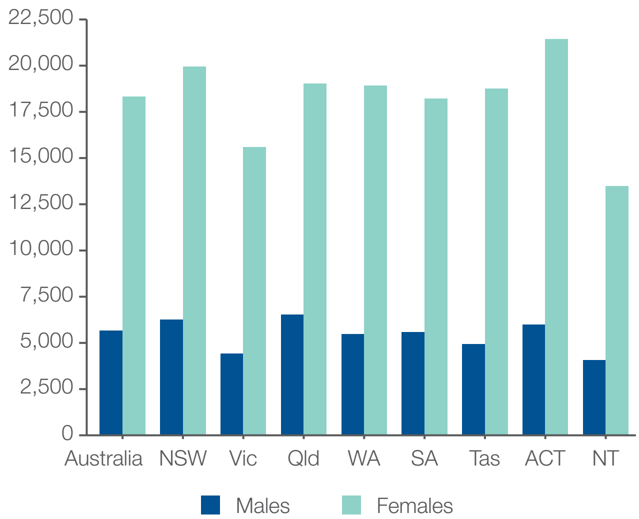
## Analysis by sex

Rates of TFTs were 3.2 times as high in females as in males.

In 2016–17, there were 558,142 MBS-subsidised services for TFTs for males aged 18 years and over, representing 5,656 services per 100,000 males (the Australian rate). The number of services varied across states and territories, from 4,072 per 100,000 males in the Northern Territory to 6,527 per 100,000 males in Queensland (Figure 3.1).

In 2016–17, there were 1,785,947 MBS-subsidised TFTs for females aged 18 years and over, representing 18,341 services per 100,000 females (the Australian rate). The number of services varied across states and territories, from 13,490 services per 100,000 females in the Northern Territory to 21,449 per 100,000 females in the Australian Capital Territory (Figure 3.1).

**Figure 3.1: Number of MBS-subsidised services for thyroid function tests per 100,000 people aged 18 years and over, age standardised, by state and territory of patient residence, by sex, 2016–17**




The data for Figure 3.1 are available at www.safetyandquality.gov.au/atlas

[#] There are 340 SA3s. For this item, data were suppressed for 79 SA3s due to one or more of a small number of services or population in an area, or potential identification of individual patients, practitioners or business entities.

**Notes:**

Some of the published SA3 rates were considered more volatile than others. These rates are excluded from the calculation of the difference between the highest and lowest SA3 rates in Australia.

For further detail about the methods used, please refer to the Technical Supplement.

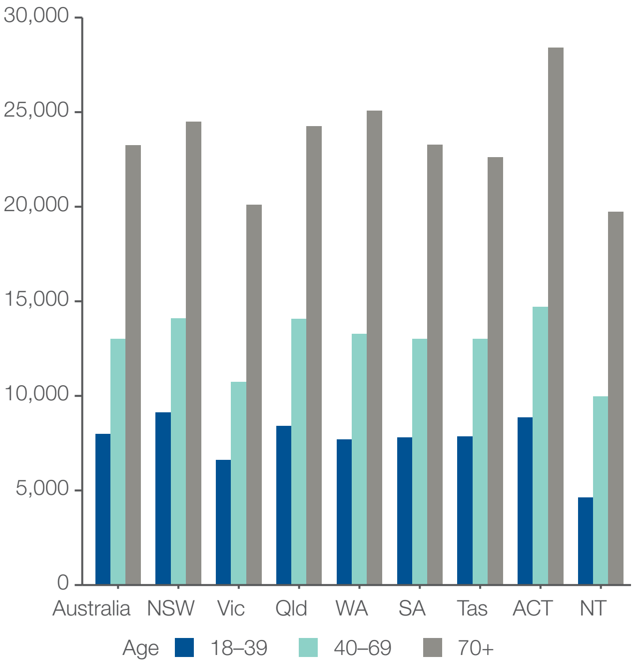
**Sources:** AIHW analysis of Medicare Benefits Schedule data and ABS Estimated Resident Population 30 June 2016.

# Thyroid function testing

## Analysis by age group

Rates of TFTs were highest for the 70 years and over age group (23,258 services per 100,000 people). The number of services for this age group varied across states and territories, from 19,735 per 100,000 people in the Northern Territory to 28,407 per 100,000 people in the Australian Capital Territory. The rate for the 70 years and over age group was 1.8 times as high as the rate for the 40–69 years age group and 2.9 times as high as the rate for the 18–39 years age group (Figure 3.2).

**Figure 3.2: Number of MBS-subsidised services for thyroid function tests per 100,000 people in specific age group, age and sex standardised, by state and territory of patient residence, 2016–17**

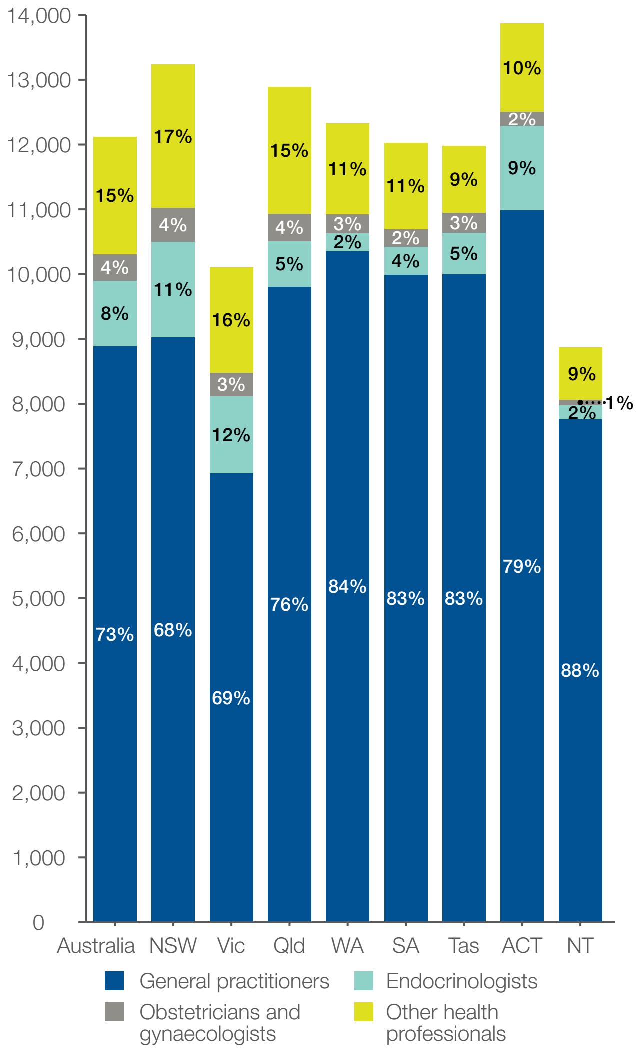



The data for Figure 3.2 and 3.3 are available at www.safetyandquality.gov.au/atlas

## Analysis by referrer type

GPs ordered 73% of TFTs in Australia, endocrinologists ordered 8%, obstetricians and gynaecologists ordered 4%, and other health professionals ordered 15%. The proportion ordered by GPs varied from 68% in New South Wales to 88% in the Northern Territory (Figure 3.3).

**Figure 3.3: Number of MBS-subsidised services for thyroid function tests per 100,000 people aged 18 years and over, age and sex standardised, by state and territory of patient residence, by referrer type, 2016–17**




**Notes:**
Specialty of referrer was derived for some records for which this information was unknown.
For further detail about the methods used, please refer to the Technical Supplement.
**Sources:** AIHW analysis of Medicare Benefits Schedule data and ABS Estimated Resident Population 30 June 2016.

## Interpretation

Variation in rates of thyroid function testing is likely to be due to geographical differences in the factors discussed below.

### Clinical decision-making

Rates of thyroid function testing will be influenced by clinicians' adherence to guidelines – for example, different approaches to screening patients with TFTs, or the frequency and appropriateness of repeat testing for certain conditions. Clinicians' decision-making, and how clinicians respond to patient requests for testing, also influence requesting of tests.[13]

Clinical information systems may affect the choice of tests. For example, if a short-cut menu in GP software lists TSH tests in combination with TFTs, then it is likely that fewer standalone TSH tests will be ordered.

### Rates of underlying disease

Variation is warranted and desirable when it reflects variation in the underlying need for care. Areas with higher rates of thyroid disease, conditions that affect the thyroid such as diabetes, and other symptoms for which TFTs are indicated, are expected to have higher rates of thyroid function testing. Rates of thyroid dysfunction are affected by the local prevalence of iodine deficiency, as iodine is essential for production of thyroid hormones.[14] Tasmania had the highest rate of iodine deficiency in Australia in 2011–12, and Western Australia had the lowest.[14] Iodine deficiency was also more common in inner regional areas of Australia than in major cities (15.4% compared with 11.9%).[14]

Health conditions that are more common in areas of socioeconomic disadvantage, such as obesity, depression and anxiety, may have contributed to the higher rates of TSH testing seen in these areas. TSH testing is recommended for patients with unexplained weight change and tiredness.[3,15]

### Access to services

Population groups with more frequent GP visits, and those with greater geographic access to a GP and the ability to pay out-of-pocket costs may be more likely to have thyroid function testing.

### Availability of previous test results

Difficulty in accessing previous results of thyroid function testing may contribute to requests for repeat tests.[13] MBS data from 2014 showed that 38% of patients had a repeat TSH test within 12 months of their first test.[1] Ease of access to previous results in computerised record systems may vary and influence local rates of testing.

### Episode coning

There are no published data on the extent of episode coning for TSH tests and TFTs. It is also unclear if the proportion of tests 'coned out' varies across the country. Refer to 'About the data' for more information on episode coning.

### Pathology provider practices

Differences in pathology provider practices may be a source of variation. For example, recommendations about repeat testing may vary between pathology providers.

# Thyroid function testing

## Promoting appropriate care

High rates of thyroid function testing in Australia, and the variation between practitioners noted by the MBS Review Taskforce, suggest that standardising practice could have benefits for sustainability of the health system. Successful interventions to improve the quality of requesting for thyroid function testing have included audit and feedback, guidelines, changes to funding policy and educational programs.[12]

The MBS Review Taskforce recently recommended that several of these interventions be put in place to improve the quality of thyroid function testing in general practice: education programs for GPs and consumers, and an audit and feedback program for GPs.[1] The MBS Review Taskforce also recommended changing MBS item descriptors to align with guidelines.[1]

Other strategies that have been suggested for improving the quality of TFT use include a role for laboratories in managing the timing of follow-up TSH testing, improving access to previous test results and narrowing the range of TSH levels that would trigger testing of T4.[13,16,17]

### Timing of repeat testing

The appropriateness of repeat TSH testing may deserve particular focus in education. Analysis of TSH testing in Tasmania between 1995 and 2013 showed that the rate of initial testing remained stable, but the rate of follow-up TSH tests increased four-fold.[18] The timing of repeat testing requested by GPs may not align well with guidelines.[17] In a study of people taking levothyroxine therapy in the United Kingdom, the frequency of repeat TSH testing was too short, on average, for patients with normal initial TFT results, and too long for patients with abnormal test results.[17] Direct requesting of follow-up thyroid tests by laboratories (with the facility for override by clinicians) has been suggested as a way to bring patients more quickly to target TSH levels and reduce unnecessary testing.[17]

### Access to previous results

Results of previous thyroid function testing requested within a practice, and by clinicians in other practices or in hospital, can be difficult to access.[13] Use of a central repository for test results, such as My Health Record, could reduce unnecessary repeat testing and duplicate requesting of pathology tests.

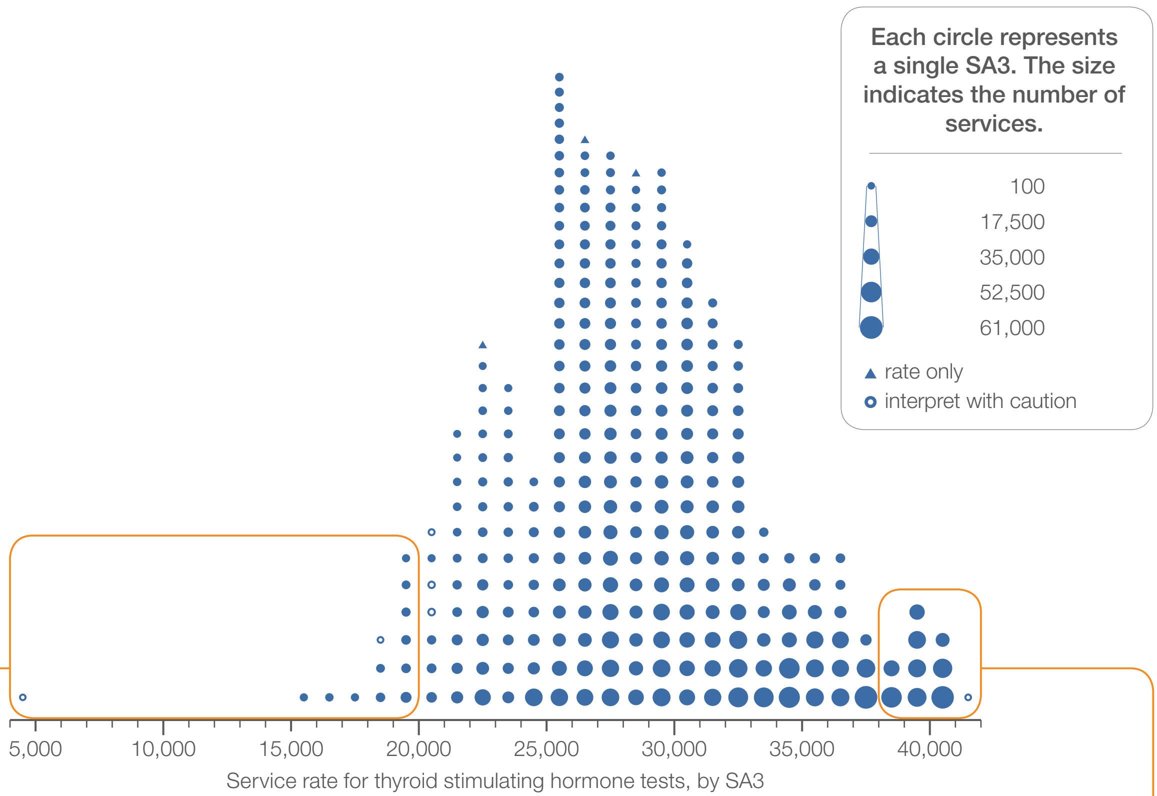
### Cut-off levels for reflex testing

Laboratories often measure TSH alone in initial assessment of thyroid function, and measure T4 only if the TSH level is outside the reference range (reflex testing).[16] This means that T4 is measured only when an abnormal result is reasonably likely.[16] There is some evidence that changing the cut-off level of TSH that would trigger reflex testing could reduce the number of T4 tests without adversely affecting patient care.[16]

# Thyroid stimulating hormone tests

## Rates by local area

**Figure 3.4: Number of MBS-subsidised services for thyroid stimulating hormone tests per 100,000 people aged 18 years and over, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2016–17**




### Lowest rate areas

| SA3 | State | Rate | Services |
|---|---|---|---|
| Norfolk Island | OT | **4,438*** | 76 |
| Whitsunday | Qld | **15,735** | 2,676 |
| Far North | Qld | **16,950** | 3,568 |
| Snowy Mountains | NSW | **17,456** | 2,906 |
| Hobart Inner | Tas | **18,037** | 7,802 |
| Barkly | NT | **18,119*** | 666 |
| Alice Springs | NT | **18,685** | 5,264 |
| Hobart - South and West | Tas | **19,048** | 5,039 |
| Hobart - North East | Tas | **19,053** | 8,400 |
| Tablelands (East) - Kuranda | Qld | **19,071** | 6,690 |
| Hobart - North West | Tas | **19,669** | 8,472 |
| Sorell - Dodges Ferry | Tas | **19,822** | 2,623 |
| Launceston | Tas | **19,995** | 13,569 |

### Highest rate areas

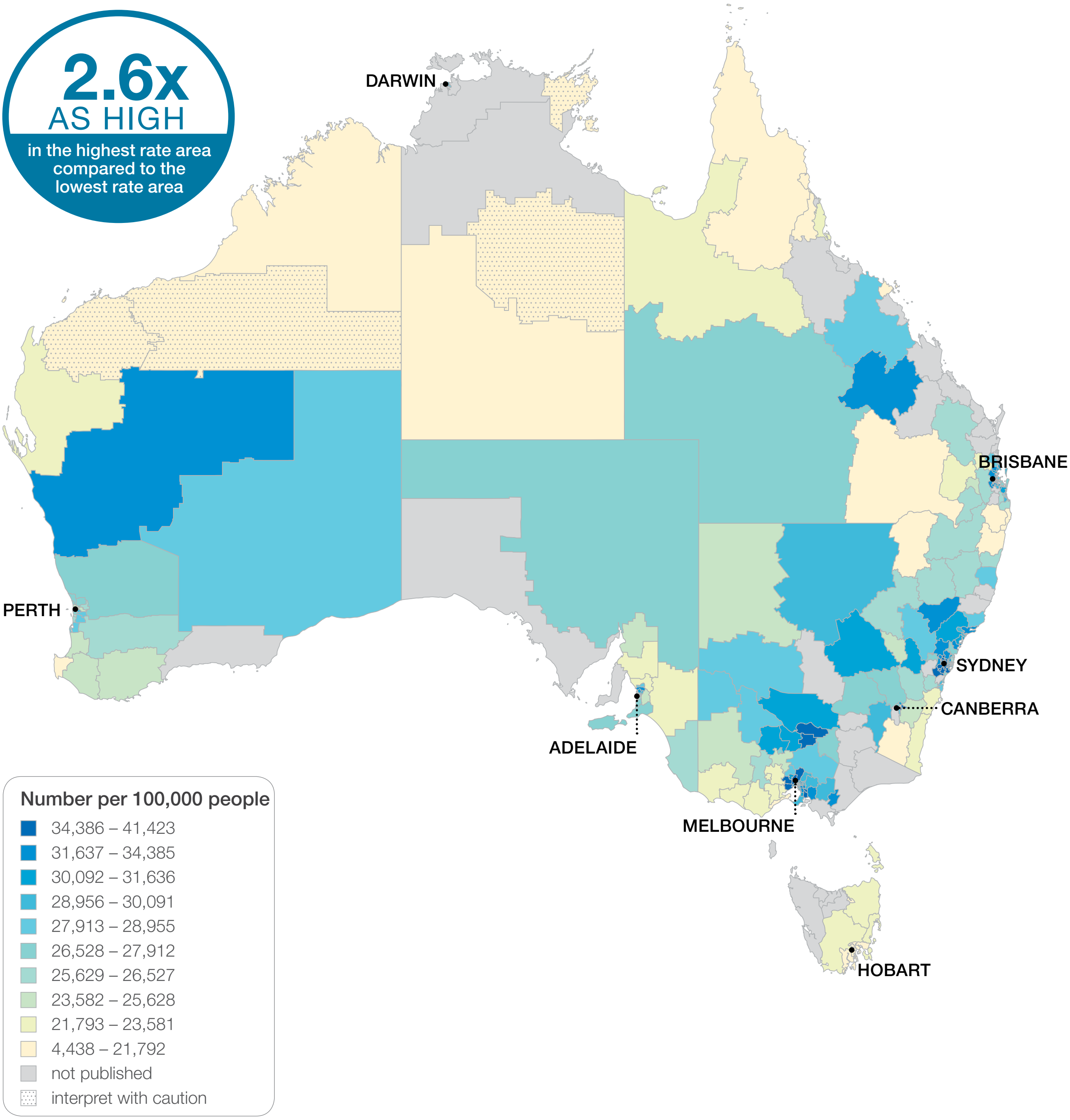
| SA3 | State | Rate | Services |
|---|---|---|---|
| Canberra East | ACT | **41,423*** | 421 |
| Blacktown - North | NSW | **40,814** | 25,640 |
| Fairfield | NSW | **40,033** | 60,113 |
| Tullamarine - Broadmeadows | Vic | **40,033** | 47,297 |
| Mount Druitt | NSW | **39,753** | 31,600 |
| Merrylands - Guildford | NSW | **39,646** | 45,486 |
| Blacktown | NSW | **39,481** | 41,021 |
| Canterbury | NSW | **39,290** | 42,061 |
| Bankstown | NSW | **38,944** | 52,385 |
| Liverpool | NSW | **38,631** | 33,999 |

**Notes:**
Hollow circles (○) and asterisks (*) indicate rates that are considered more volatile than other published rates and should be interpreted with caution.
Triangles (▲) indicate SA3s where only rates are published. The numbers of services are not published for confidentiality reasons.
OT represents other territories.
For further detail about the methods used, please refer to the Technical Supplement.
**Sources:** AIHW analysis of Medicare Benefits Schedule data and ABS Estimated Resident Population 30 June 2016.

# Thyroid stimulating hormone tests

## Rates across Australia

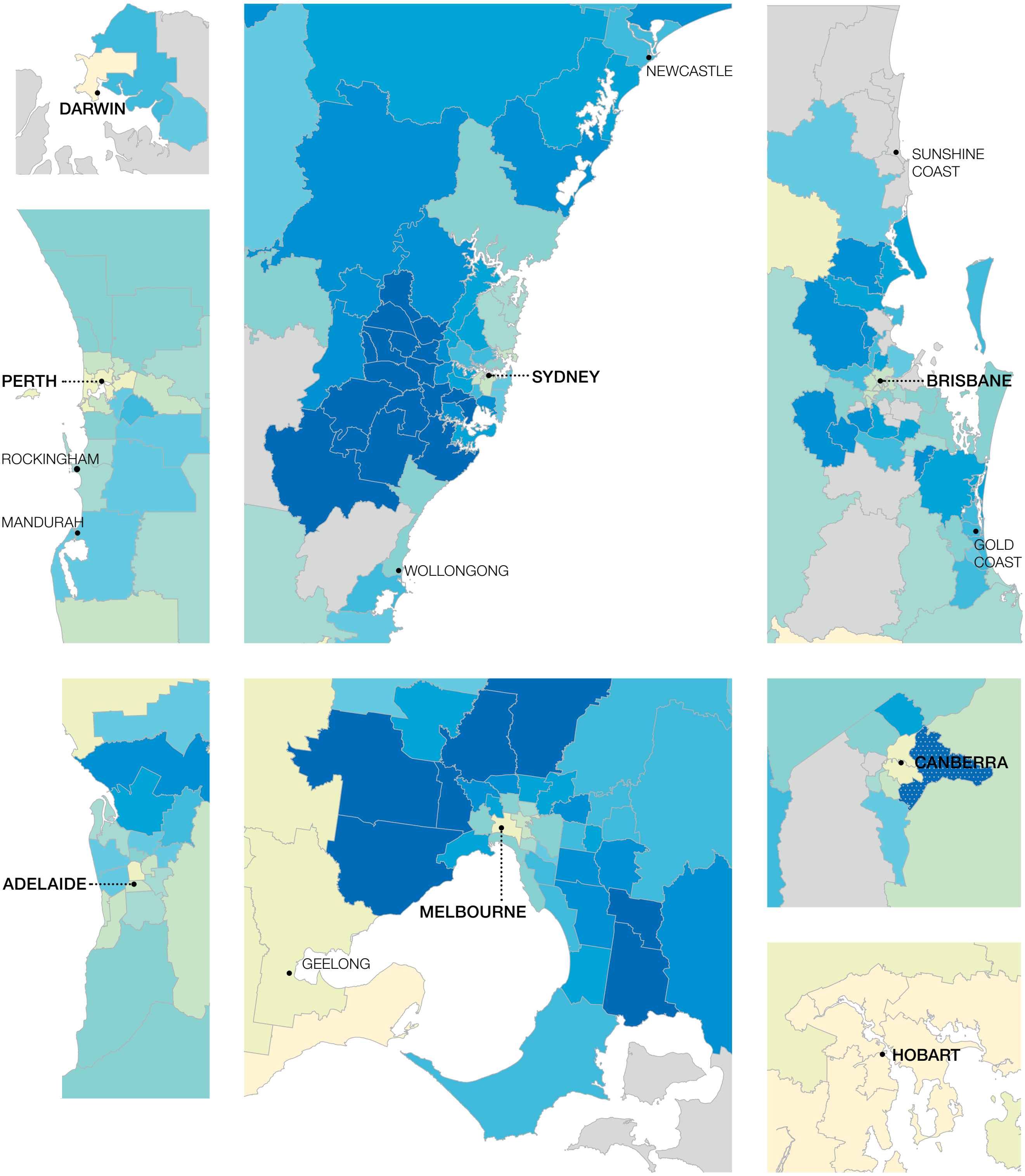
**Figure 3.5:** Number of MBS-subsidised services for thyroid stimulating hormone tests per 100,000 people aged 18 years and over, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2016–17




**Notes:**
Dotted areas indicate rates that are considered more volatile than other published rates and should be interpreted with caution. These rates are excluded from the calculation of the difference between the highest and lowest SA3 rates in Australia.
For further detail about the methods used, please refer to the Technical Supplement.
**Sources:** AIHW analysis of Medicare Benefits Schedule data and ABS Estimated Resident Population 30 June 2016.

## Rates across capital city areas

**Figure 3.6: Number of MBS-subsidised services for thyroid stimulating hormone tests per 100,000 people aged 18 years and over, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2016–17**



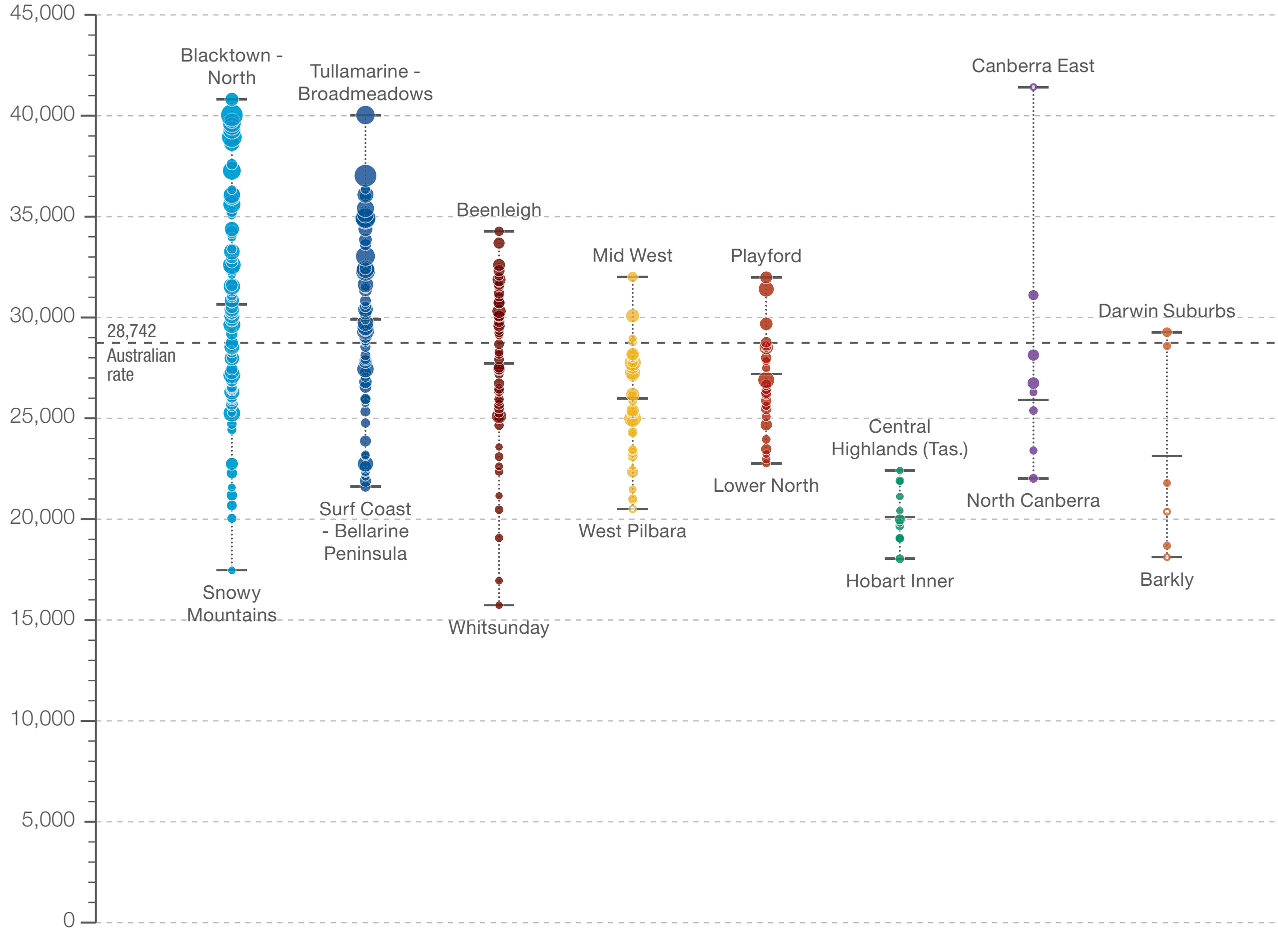

**Notes:**
Dotted areas indicate rates that are considered more volatile than other published rates and should be interpreted with caution.
For further detail about the methods used, please refer to the Technical Supplement.
**Sources:** AIHW analysis of Medicare Benefits Schedule data and ABS Estimated Resident Population 30 June 2016.

# Thyroid stimulating hormone tests

## Rates by state and territory

**Figure 3.7: Number of MBS-subsidised services for thyroid stimulating hormone tests per 100,000 people aged 18 years and over, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2016–17**

| | NSW | Vic | Qld | WA | SA | Tas | ACT | NT |
|---|---|---|---|---|---|---|---|---|
| Highest rate | 40,814 | 40,033 | 34,270 | 32,010 | 31,987 | 22,417 | 41,423* | 29,270 |
| State/territory | 30,640 | 29,899 | 27,712 | 25,988 | 27,176 | 20,106 | 25,920 | 23,145 |
| Lowest rate | 17,456 | 21,613 | 15,735 | 20,515* | 22,765 | 18,037 | 22,024 | 18,119* |
| No. services | 1,906,486 | 1,471,039 | 1,055,392 | 514,853 | 386,639 | 87,638 | 79,354 | 37,837 |




Each circle represents a single SA3. The size indicates the number of services.

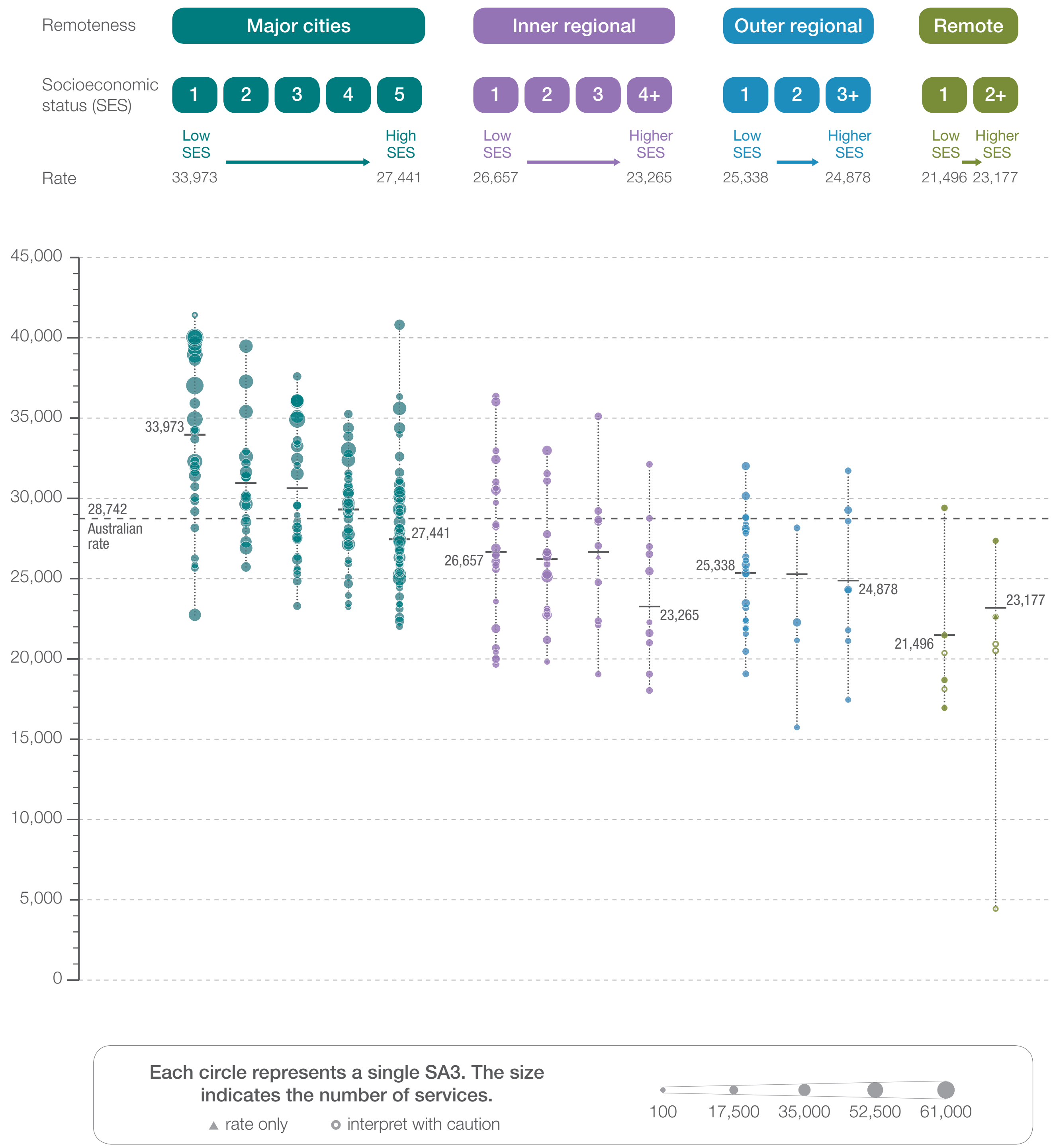
▲ rate only ⚬ interpret with caution

100 17,500 35,000 52,500 61,000

**Notes:**
Hollow circles (⚬) and asterisks (*) indicate rates that are considered more volatile than other published rates and should be interpreted with caution.
Triangles (▲) indicate SA3s where only rates are published. The numbers of services are not published for confidentiality reasons.
For further detail about the methods used, please refer to the Technical Supplement.
**Sources:** AIHW analysis of Medicare Benefits Schedule data and ABS Estimated Resident Population 30 June 2016.

## Rates by remoteness and socioeconomic status

**Figure 3.8: Number of MBS-subsidised services for thyroid stimulating hormone tests per 100,000 people aged 18 years and over, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2016–17**



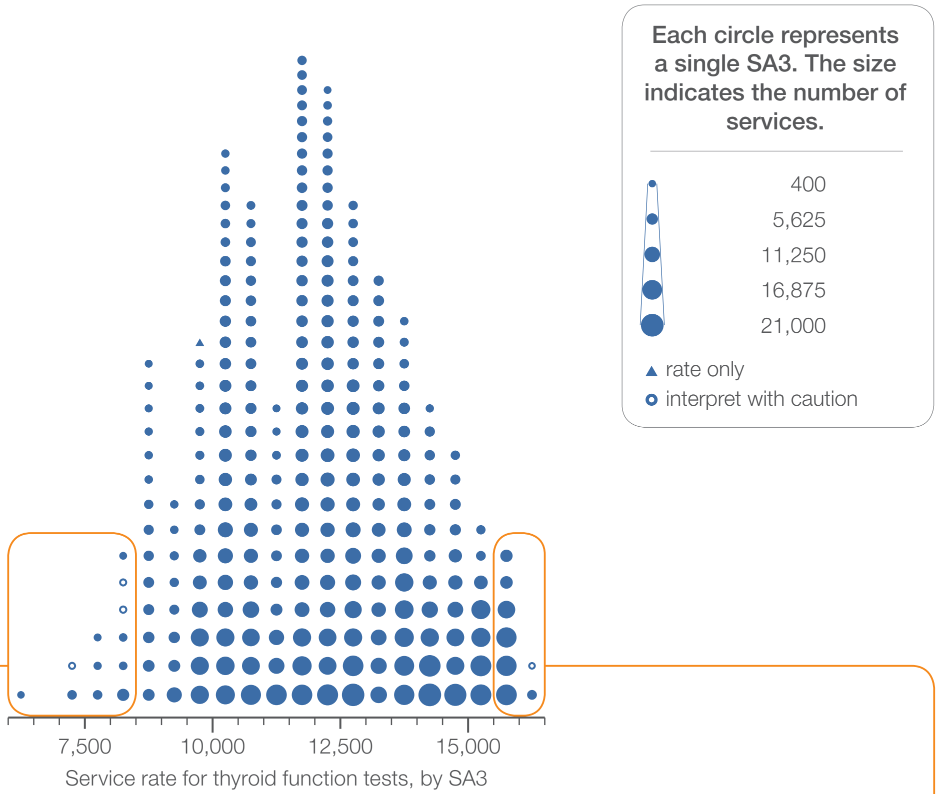

**Notes:**
Hollow circles (○) indicate rates that are considered more volatile than other published rates and should be interpreted with caution.
Triangles (▲) indicate SA3s where only rates are published. The numbers of services are not published for confidentiality reasons.
For further detail about the methods used, please refer to the Technical Supplement.
**Sources:** AIHW analysis of Medicare Benefits Schedule data and ABS Estimated Resident Population 30 June 2016.

# Thyroid function testing

# Thyroid function tests

## Rates by local area

**Figure 3.9: Number of MBS-subsidised services for thyroid function tests per 100,000 people aged 18 years and over, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2016–17**




**Lowest rate areas**

| SA3 | State | Rate | Services |
|---|---|---|---|
| Gascoyne | WA | **6,425** | 459 |
| Litchfield | NT | **7,470*** | 1,097 |
| Gippsland - East | Vic | **7,487** | 3,229 |
| Upper Murray exc. Albury | NSW | **7,531** | 3,143 |
| Esperance | WA | **7,634** | 1,005 |
| Darwin City | NT | **7,664** | 1,473 |
| East Pilbara | WA | **8,051*** | 1,166 |
| Maryborough - Pyrenees | Vic | **8,092** | 1,930 |
| Melbourne City | Vic | **8,107** | 6,733 |
| Kimberley | WA | **8,230** | 1,861 |
| West Pilbara | WA | **8,243*** | 1,421 |
| Loddon - Elmore | Vic | **8,428** | 853 |

**Highest rate areas**

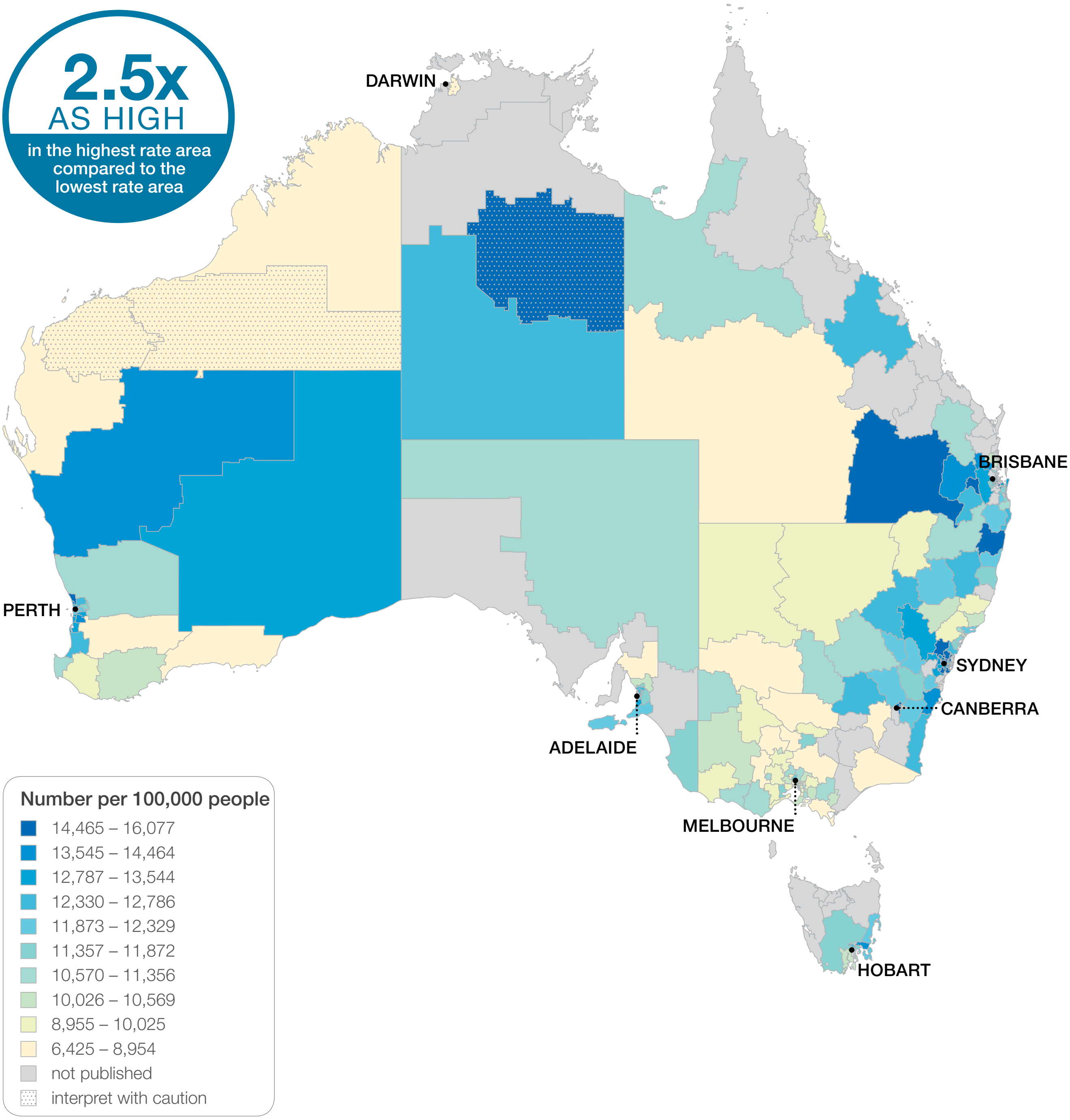
| SA3 | State | Rate | Services |
|---|---|---|---|
| Dural - Wisemans Ferry | NSW | **16,077** | 3,504 |
| Barkly | NT | **16,038*** | 509 |
| Gungahlin | ACT | **15,983** | 6,935 |
| Sutherland - Menai - Heathcote | NSW | **15,927** | 14,081 |
| Baulkham Hills | NSW | **15,897** | 18,342 |
| Parramatta | NSW | **15,778** | 17,670 |
| Clarence Valley | NSW | **15,598** | 7,337 |
| Merrylands - Guildford | NSW | **15,587** | 17,807 |

**Notes:**
Hollow circles (○) and asterisks (*) indicate rates that are considered more volatile than other published rates and should be interpreted with caution.
Triangles (▲) indicate SA3s where only rates are published. The numbers of services are not published for confidentiality reasons.
For further detail about the methods used, please refer to the Technical Supplement.
**Sources:** AIHW analysis of Medicare Benefits Schedule data and ABS Estimated Resident Population 30 June 2016.

# Thyroid function tests

## Rates across Australia

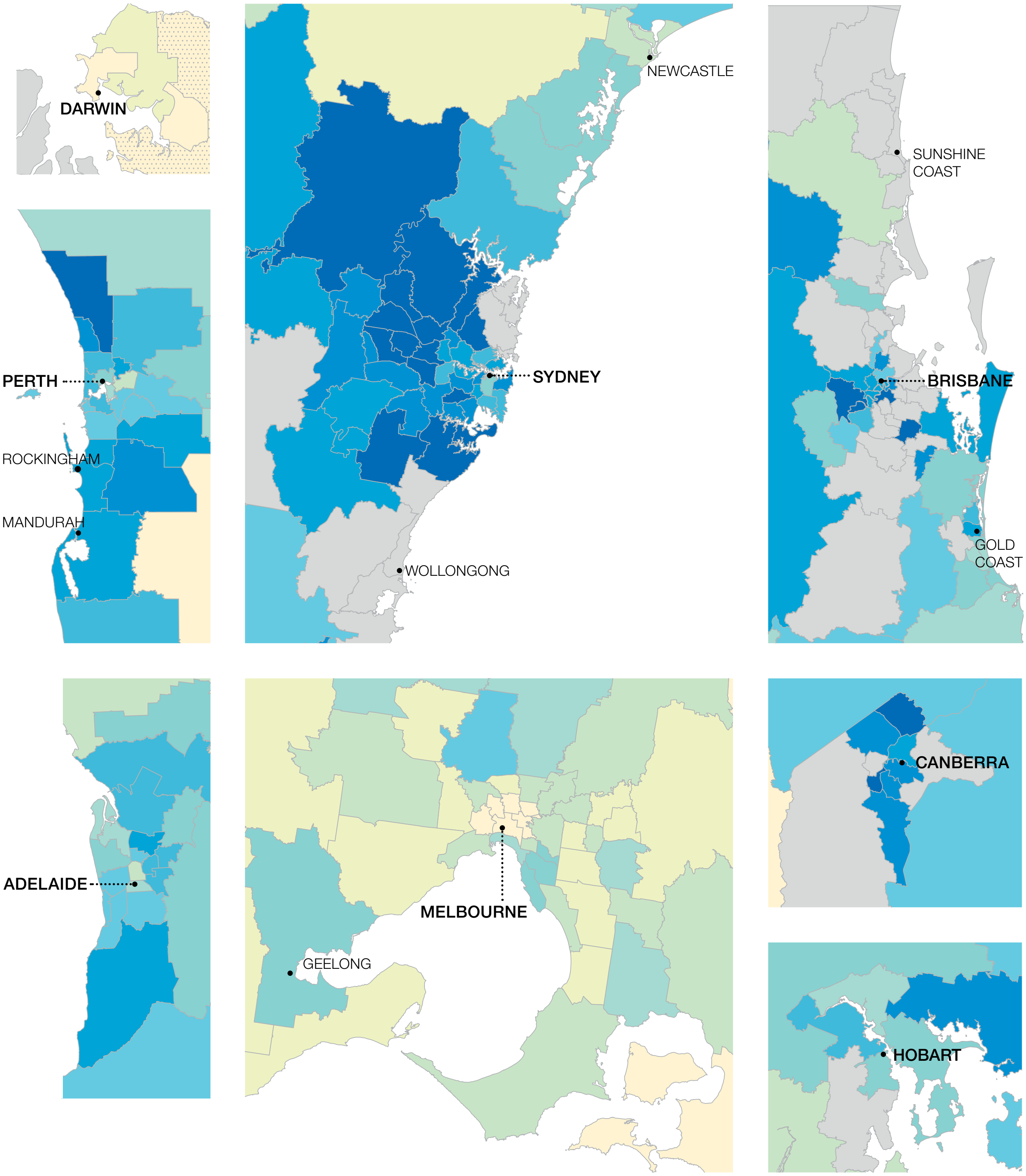
**Figure 3.10:** Number of MBS-subsidised services for thyroid function tests per 100,000 people aged 18 years and over, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2016–17




**Notes:**
Dotted areas indicate rates that are considered more volatile than other published rates and should be interpreted with caution. These rates are excluded from the calculation of the difference between the highest and lowest SA3 rates in Australia.
For further detail about the methods used, please refer to the Technical Supplement.
**Sources:** AIHW analysis of Medicare Benefits Schedule data and ABS Estimated Resident Population 30 June 2016.

# Rates across capital city areas

**Figure 3.11: Number of MBS-subsidised services for thyroid function tests per 100,000 people aged 18 years and over, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2016–17**



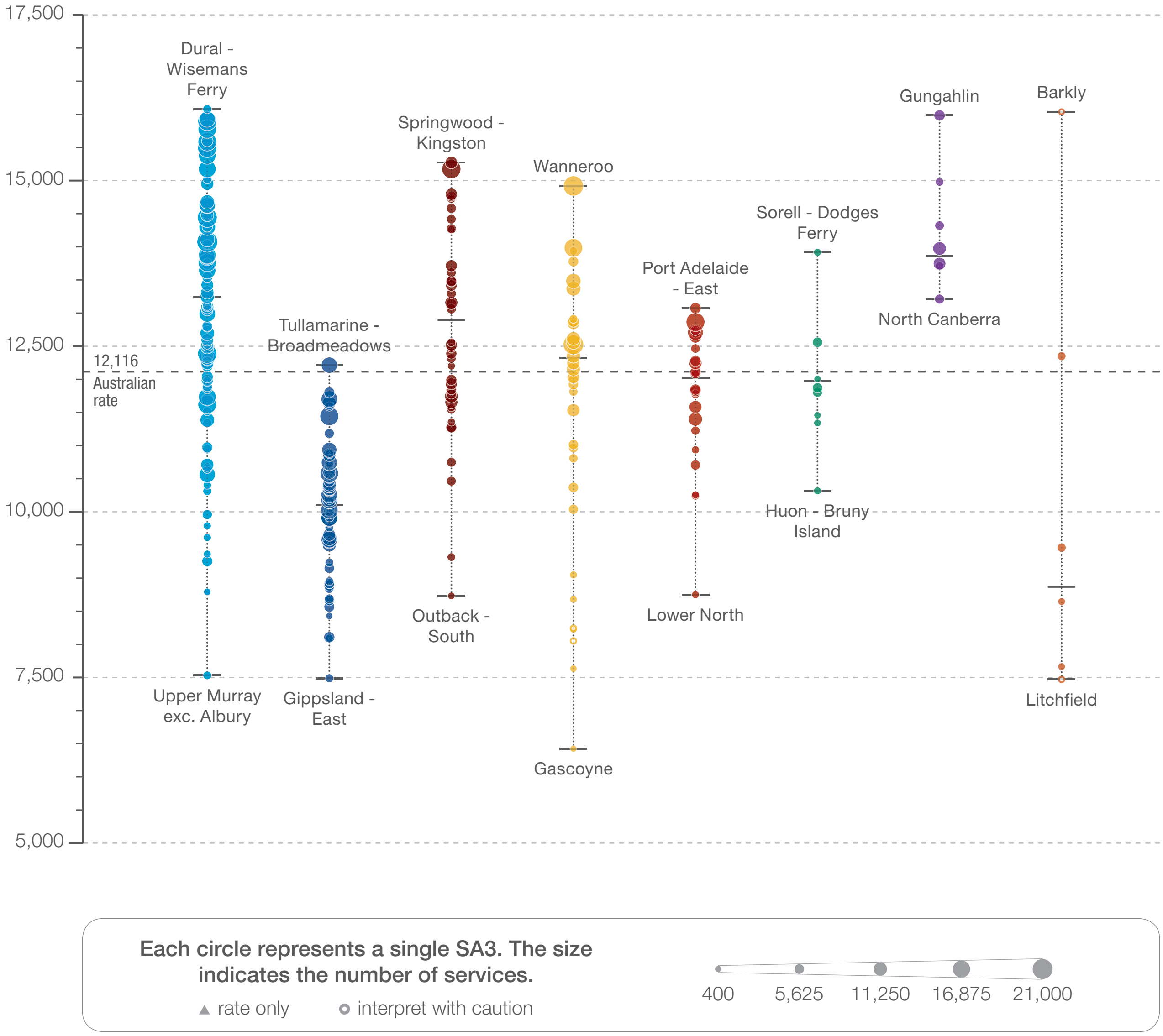

**Notes:**
Dotted areas indicate rates that are considered more volatile than other published rates and should be interpreted with caution.
For further detail about the methods used, please refer to the Technical Supplement.
**Sources:** AIHW analysis of Medicare Benefits Schedule data and ABS Estimated Resident Population 30 June 2016.

# Thyroid function tests

## Rates by state and territory

**Figure 3.12: Number of MBS-subsidised services for thyroid function tests per 100,000 people aged 18 years and over, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2016–17**

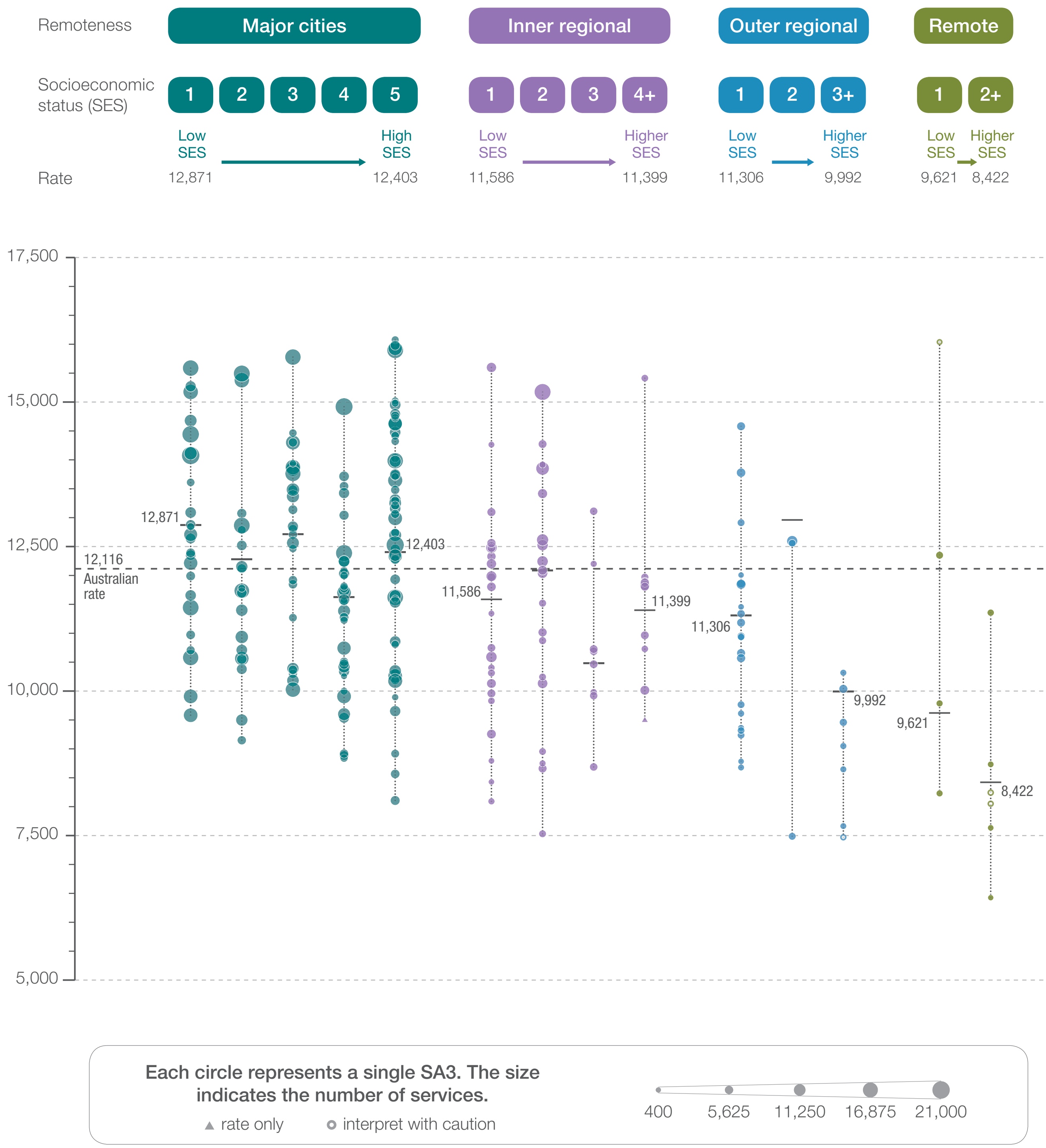
| | NSW | Vic | Qld | WA | SA | Tas | ACT | NT |
|---|---|---|---|---|---|---|---|---|
| Highest rate | 16,077 | 12,214 | 15,273 | 14,919 | 13,074 | 13,917 | 15,983 | 16,038* |
| State/territory | 13,234 | 10,105 | 12,892 | 12,324 | 12,027 | 11,978 | 13,866 | 8,868 |
| Lowest rate | 7,531 | 7,487 | 8,732 | 6,425 | 8,749 | 10,317 | 13,211 | 7,470* |
| No. services | 824,854 | 500,080 | 492,076 | 243,925 | 173,540 | 53,280 | 42,246 | 13,879 |




**Notes:**
Hollow circles (○) and asterisks (*) indicate rates that are considered more volatile than other published rates and should be interpreted with caution.
Triangles (▲) indicate SA3s where only rates are published. The numbers of services are not published for confidentiality reasons.
For further detail about the methods used, please refer to the Technical Supplement.
**Sources:** AIHW analysis of Medicare Benefits Schedule data and ABS Estimated Resident Population 30 June 2016.

# Rates by remoteness and socioeconomic status

**Figure 3.13:** Number of MBS-subsidised services for thyroid function tests per 100,000 people aged 18 years and over, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2016–17




**Notes:**
Hollow circles (○) indicate rates that are considered more volatile than other published rates and should be interpreted with caution.
Triangles (▲) indicate SA3s where only rates are published. The numbers of services are not published for confidentiality reasons.
For further detail about the methods used, please refer to the Technical Supplement.
**Sources:** AIHW analysis of Medicare Benefits Schedule data and ABS Estimated Resident Population 30 June 2016.

# Thyroid function testing

## Resources

- Royal Australian College of General Practitioners, *Guidelines for Preventive Activities in General Practice* (9th edition), Section 15: Screening tests of unproven benefit[19]
- Royal College of Pathologists of Australasia, position statement: Thyroid function testing for adult diagnosis and monitoring, July 2017[3]
- *Therapeutic Guidelines: Endocrinology* (for electronic version, visit http://tgldcdp.tg.org.au/etgcomplete).[20]

## Australian initiatives

The information in this chapter will complement work already under way to improve the appropriateness of thyroid function testing in Australia. At a national level, this work includes:

- Royal Australian College of General Practitioners. Choosing Wisely recommendation 10: Don't test thyroid function as population screening for asymptomatic patients[10]
- Endocrine Society of Australia, Choosing Wisely recommendation 5: Don't order a total or free T3 level when assessing thyroxine dose in hypothyroid patients[21]
- Royal Australian and New Zealand College of Obstetricians and Gynaecologists, testing of serum TSH levels in pregnant women.[22]

State and territory initiatives are also in place to improve the appropriateness of thyroid function testing, including:

- Tasmanian Health Pathways, thyroid investigations.

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# 3.2 Neck ultrasound and thyroidectomy

## Why is this important?

Neck ultrasound can be used to investigate suspected disease of the thyroid gland, including the examination of thyroid nodules (or lumps) for possible cancer. Nodules found to be malignant are usually treated with thyroidectomy (removal of the thyroid) with a combination of other treatments, depending on the characteristics of the cancer.[1] Some small thyroid cancers (thyroid papillary microcarcinomas) have a very low risk of harm if left untreated.[1] The benefit to patients of detecting and managing these is unclear.[2]

Australia and other developed countries have seen a substantial rise in thyroid cancer incidence in the past three decades.[3-5] In some developed countries, the incidence rise has been clearly driven by increased use of ultrasound and investigation of small low-risk thyroid cancers, which has led to a rise in thyroidectomy.[4] While detection of more small, low-risk thyroid cancers does not fully explain the rising incidence of thyroid cancer in Australia[6], experiences from other countries highlight the importance of ensuring appropriate use of ultrasound for investigating the thyroid, and thyroidectomy.[4,5]

Mapping use of ultrasound for thyroid cancer is not currently possible in Australia because of limitations with the national data sources. For example, the Medicare Benefits Schedule (MBS) dataset does not have a specific item for ultrasound for thyroid investigation. As a first step, the Atlas maps rates of neck ultrasound and thyroidectomy to identify potential unwarranted variation and to highlight opportunities for improving data collection on thyroid cancer investigations and treatments.

## What did we find?

The Atlas found the rate of neck ultrasound varies up to six-fold and the rate of thyroidectomy varies up to five-fold between local areas across Australia. Underlying patterns of disease are unlikely to fully explain the size of the variations seen.

# Neck ultrasound and thyroidectomy

### What can be done?

Strategies to improve the use of thyroid investigations include:

- Ensuring that ultrasounds for investigation of the thyroid are requested only when a patient has clinically detected, visible or palpable thyroid nodules or goitre (enlarged thyroid gland), is otherwise known to be at risk of thyroid cancer (such as a strong family history or radiation exposure), or requires active surveillance of a known thyroid cancer, could reduce unnecessary imaging[1,7]
- Having MBS items that require the reason for neck ultrasound to be specified, including differentiation between initial investigation of thyroid abnormalities and follow-up for active surveillance would provide better information on the appropriateness of ultrasound use
- Improving information on general practitioner (GP) referrals for thyroid ultrasound, such as specifying the reason for the imaging, could help improve the benefit gained from the ultrasound
- Implementing an agreed nationally consistent approach to providing high-quality thyroid ultrasound reports, such as using the ATA (American Thyroid Association) guidelines or the TI-RADS (Thyroid Imaging Reporting and Data System) score, could help reduce unnecessary repeat ultrasounds[1]
- Giving patients clear information that allows them to make informed choices about their management options, including active surveillance by specialists as an option for some low-risk thyroid cancers[8,9]
- Ensuring that thyroid cancer is included in datasets such as the New South Wales Cancer Institute Reporting for Better Cancer Outcomes Program[10], could help reduce unwarranted variation and improve quality of care; establishment of the Australian and New Zealand Thyroid Cancer Registry also aims to help surgeons follow best practice for patients having thyroid surgery.[11]

## Context

This section includes data on neck ultrasound and thyroidectomy. These procedures are both central to the diagnosis and treatment of thyroid cancer, but are also used to investigate and treat other conditions.

Australia and other developed countries have seen a substantial rise in thyroid cancer incidence in the past three decades, but with little change in mortality.[3-5] In 2018, an estimated 3,300 people will be diagnosed with thyroid cancer in Australia. Thyroid cancer occurs three times more often in women than in men and is the seventh most common cancer affecting Australian women.[3] Aboriginal and Torres Strait Islander Australians have a similar incidence of diagnosis of thyroid cancer as other Australians but are 3.1 times as likely to die from it.[12]

There are different types of thyroid cancer: papillary, follicular, medullary and anaplastic. The papillary subtype is the most commonly diagnosed, accounting for 75% of thyroid cancers in women and 65% of thyroid cancers in men.[6] The increase in thyroid cancer diagnoses in other countries has been mainly attributed to increased detection of small papillary thyroid cancers.[4,5]

### Neck ultrasound

Neck ultrasound includes ultrasound of the thyroid gland, which is indicated for assessment of palpable goitre and thyroid nodules. Results of thyroid ultrasound are used by clinicians to determine the need for fine needle aspiration biopsy of nodules (FNAB). FNAB involves collecting a small sample of tissue for cytology (cell) testing, guided by a further thyroid ultrasound. FNAB is used for diagnostic assessment and to exclude malignancy for nodules ≥1 cm in size.[1,7]

MBS data do not differentiate between neck ultrasound for thyroid examination and neck ultrasound for other investigations. The proportion of neck ultrasound performed for thyroid examinations compared with that for other indications is not clear, but thyroid examination appears to account for the majority.[13] Neck ultrasound is also used to investigate cervical lymphadenopathy (enlargement of cervical lymph nodes) and to assess other structures in the neck, such as the salivary glands and carotid arteries. Carotid duplex imaging has separate MBS item numbers and is not included in this data item.

Guidelines recommend that everyone being investigated for possible thyroid cancer, such as people with throat symptoms, lumps or swelling in the neck, has a neck ultrasound.[1] Neck ultrasound is also recommended for active surveillance of small, low-risk thyroid cancers and to monitor disease status after thyroidectomy.[1] Neck ultrasound is not recommended for screening asymptomatic people for thyroid cancer unless the person is otherwise known to be at risk of thyroid cancer (such as having a strong family history or radiation exposure). Neck ultrasound is also not recommended for routine investigation of people with abnormal thyroid function tests if there is no palpable abnormality of the thyroid gland, or for routine follow-up of nodules that are benign.[14-16]

The crude rate of neck ultrasound in Australia quadrupled between 1997 and 2017.[17] International comparisons of neck ultrasound rates are not available.

## Thyroidectomy

Thyroidectomy involves full or partial removal of the thyroid gland. It is used to treat thyroid cancer, suspicious nodules and uncontrollable overactive thyroid gland such as in Graves' disease.[18]

Thyroidectomy carries a 2–6% risk of permanent hypoparathyroidism (dysfunction of the parathyroid glands, resulting in low blood calcium levels) and a 1–2% risk of laryngeal nerve injury (resulting in a hoarse or weak voice).[19] Most patients require lifelong thyroid hormone replacement therapy after thyroidectomy.[4]

Guidelines recommend total thyroidectomy for patients with large thyroid cancer tumours, or tumours of any size with additional risk factors.[14] Surgery for thyroid papillary microcarcinomas (cancers 10 millimetres or less in size) is a controversial issue because the risks for some individuals may outweigh the benefits.[14]

A study of New South Wales data showed that both thyroidectomy rates and thyroid cancer incidence doubled between 2003 and 2012, with no change in mortality.[20] The estimated thyroidectomy rate for 2012 in this study was 18.8 per 100,000 women and 6.0 per 100,000 men. Few international comparisons of thyroidectomy rates are available. In 2012, the age-standardised rate of thyroidectomy in Switzerland was 11.6 per 100,000 women and 4.0 per 100,000 men.[21]

Radioiodine (I-131) therapy (nuclear medicine) is also used in the postoperative treatment of thyroid cancer.[14] Ultrasound and nuclear medicine can be used to assess post-surgery thyroid cancer patients. Radioiodine has a whole-body surveillance role in patients after their initial therapy.[14]

## Thyroid cancer management in Australia

Most patients diagnosed with thyroid cancer have a very good prognosis. The five-year survival rate for thyroid cancer in Australia is 97%[3] and 92% for Aboriginal and Torres Strait Islander Australians.[12] While neck ultrasound is an important investigation for detecting thyroid cancer, there is increased awareness that the harm associated with detection of small, low-risk cancers, such as the psychological burden of a cancer diagnosis and the side effects of some treatments, may outweigh the risk these cancers pose.[7]

# Neck ultrasound and thyroidectomy

The introduction of neck ultrasonography in the late 1980s allowed the detection of thyroid nodules only a few millimetres in size, and large increases in diagnoses of thyroid cancer were subsequently seen in many high-income countries.[2,22] For example, a study in the United States reported a two-fold increase between 2000 and 2012, and the most extreme example was a 15-fold increase in South Korea between 1993 and 2011.[4,23] Despite these increases in diagnoses, mortality rates did not change substantially in either country.[4,5]

Similarly, the rate of thyroid cancer diagnoses in Australia increased between 1997 and 2017: 2.6-fold in women (from 7.0 to 18.0 per 100,000) and 2.5-fold in men (from 2.6 to 6.6 per 100,000).[24] The mortality rate over this period stayed at 0.4 per 100,000 in men, and rose from 0.4 to 0.5 per 100,000 in women.[24]

One reason for an increased incidence of cancer without an accompanying increase in mortality may be the greater detection of thyroid papillary microcarcinomas – cancers not likely to cause symptoms or death in a patient's lifetime.[4,19,25] Epidemiological modelling estimated that detection of these cancers was responsible for an estimated 10,301 extra cases of thyroid cancer in women, and 2,148 in men, between 1988 and 2007 in Australia.[22]

Greater detection of low-risk papillary cancers appears to explain most of the rise in thyroid cancer in Australia, but there is evidence that a true increase in disease has also contributed. Analysis of Queensland thyroid cancer data from 1982 to 2008 showed that the greatest increase occurred in diagnosis of early-stage cancers, but a significant increase in the incidence of advanced cancers was also found.[6] In a similar study of Tasmanian data from 1988 to 1998, thyroid papillary microcarcinoma accounted for most of the rising thyroid cancer incidence, but the rate of larger papillary thyroid cancers also increased.[26] The fact that the incidence of high-grade thyroid disease has increased without an increase in mortality suggests that advanced thyroid cancer is being appropriately identified and successfully treated.

Suggested causes for the increase in thyroid cancer incidence beyond increased testing include radiation exposure in children due to medical imaging, rising rates of diabetes and obesity, and iodine deficiency and excess.[5] Radiation exposure due to computed tomography (CT) scans in children is likely to account for less than 1% of the increased incidence of thyroid cancer, according to an analysis from the United States.[5] The evidence is conflicting or weak at this stage for an association between thyroid cancer and diabetes or iodine intake.[5] Whether there is a causal relationship between increased prevalence of obesity and increasing thyroid cancer rates is also unclear.[27,28]

# Neck ultrasound

## About the data

Data are sourced from the MBS dataset.

This dataset includes information on MBS claims processed by the Australian Government Department of Human Services. It covers a wide range of services (attendances, procedures, tests) provided across primary care and hospital settings.

The dataset does not include:

- Services for publicly funded patients in hospitals
- Services for patients in hospital outpatient clinics where claims are not made to the MBS
- Services covered under Department of Veterans' Affairs arrangements.

Rates are based on the number of MBS-subsidised services for neck ultrasound per 100,000 people aged 18 years and over in 2016–17.

Because an MBS claim is included for each service rather than for each patient, patients who receive a service more than once in the financial year will have more than one MBS claim counted.

The analysis and maps are based on the residential address of the patient recorded in the MBS claim and not the location of the service.

Rates are age and sex standardised to allow comparisons between populations with different age and sex structures.

Data were not analysed by Aboriginal and Torres Strait Islander status as this information was not available for the MBS data at the time of publication.

## What do the data show?

### Magnitude of variation

In 2016–17, there were 308,247 MBS-subsidised services for neck ultrasound, representing 1,606 services per 100,000 people aged 18 years and over (the Australian rate).

The number of MBS-subsidised services for neck ultrasound across 329* local areas (Statistical Area Level 3 – SA3), ranged from 513 to 2,893 per 100,000 people aged 18 years and over. The rate was **5.6 times as high** in the area with the highest rate compared to the area with the lowest rate. The number of services varied across states and territories, from 983 per 100,000 people aged 18 years and over in the Northern Territory to 1,946 in New South Wales (Figures 3.17–3.20).

After the highest and lowest 10% of results were excluded and 265 SA3s remained, the number of services per 100,000 people aged 18 years and over was 2.1 times as high in the area with the highest rate compared to the area with the lowest rate.

### Analysis by remoteness and socioeconomic status

Rates of neck ultrasound were higher in major cities than in other areas. Rates were higher in areas with lower socioeconomic status in major cities and remote areas. However, there was no clear pattern according to socioeconomic status in other remoteness categories (Figure 3.21).

* There are 340 SA3s. For this item, data were suppressed for 11 SA3s due to one or more of a small number of services or population in an area, or potential identification of individual patients, practitioners or business entities.

**Notes:**

Some of the published SA3 rates were considered more volatile than others. These rates are excluded from the calculation of the difference between the highest and lowest SA3 rates in Australia.

For further detail about the methods used, please refer to the Technical Supplement.

# Neck ultrasound

## Interpretation

Variation in rates of neck ultrasound is likely to be due to geographical differences in the factors discussed below.

### Access to services

Access to ultrasound services, and medical and surgical specialists (for example, specialist endocrine surgeons, and head and neck surgeons) could explain higher rates in major cities. Rates of neck ultrasound were also markedly higher in the most populous states (New South Wales, Victoria and Queensland) than elsewhere, which may also reflect differences in access to ultrasound and specialist services.

It is likely that having greater access to medical care increases investigations for thyroid abnormalities. About 60% of patients in a New South Wales study were diagnosed with thyroid cancer in the absence of symptoms.[29] Compared with people living in rural areas, people living in metropolitan areas were more likely to be diagnosed as a result of surgery for benign thyroid disease or diagnostic imaging for another health problem, or after a thyroid lump was first noticed by a doctor.[29]

Higher rates of neck ultrasound in major cities could also reflect more intensive monitoring following thyroidectomy because it is easier for patients to access ultrasound services.[1] As well, more patients in major cities may opt for active surveillance of low-risk papillary cancers compared to patients elsewhere because of better access with specialist services. However, rates of thyroidectomy were also found to be higher in major cities and inner regional areas (see 'Thyroidectomy'), suggesting that access to health services generally may contribute more to variation than having treatment choices.

### Use of other imaging tests

Referrals arising from incidental findings of thyroid nodules following diagnostic imaging for other health problems may be a source of variation. This may include referrals from Doppler carotid artery assessment, CT scans, magnetic resonance imaging (MRI) and positron emission tomography (PET) scans.[2,29]

### Clinical decision-making

Clinical decision-making about whether to actively search for thyroid nodules during physical examination may influence the rate of neck ultrasound.[28] Differences in adherence to guidelines on use of ultrasound for suspected thyroid disease are likely to account for some variation. For example, higher rates could be associated with either inappropriate use of neck ultrasound for screening or appropriate use for active surveillance of small, low-risk cancers.

### Numbers of repeat ultrasounds

Differences in the quality of ultrasound reports and cytology reports are likely to affect numbers of repeat ultrasounds. Higher rates of indeterminate findings following an FNAB may also lead to higher rates of repeat ultrasound.[1]

### Rates of underlying disease

Prevalence of underlying diseases, and of symptoms or history that would prompt testing for thyroid disease, could also affect rates.

Rates of neck ultrasound were higher in areas with low socioeconomic status in major cities and remote areas. This finding contrasts with research from the United States that showed a higher incidence of thyroid cancer in areas with high socioeconomic status[25], which was considered to reflect greater access to diagnostic services.[30] Reasons for the pattern in Australia are unclear.

# Thyroidectomy

### Funding models

The data for this item exclude services that are free of charge to public patients in hospitals, such as neck ultrasound done for public patients in public hospital outpatient clinics or emergency departments. This means that the funding models for neck ultrasound services available in an area, and the relative accessibility of services to patients, may influence the variation seen. For example, the rates of neck ultrasound seen in remote Western Australia, South Australia and the Northern Territory may be low because a higher proportion of ultrasounds in these areas is done for public patients in hospital outpatient clinics (which are not counted in this data item). In contrast, the rates in New South Wales may be high because there are many locations in New South Wales where services and investigations undertaken in public hospital outpatient clinics are claimed through the MBS under specialist medical practitioner rights of private practice.

Because MBS data do not differentiate between neck ultrasound and thyroid ultrasound, variations in rates of neck ultrasound performed for reasons other than thyroid investigation will also affect the rates reported here.

## About the data

Data are sourced from the National Hospital Morbidity Database, and include admitted patients in both public and private hospitals.

Rates are based on the number of hospitalisations for thyroidectomy per 100,000 people aged 18 years and over, over the three-year period 2014–15 to 2016–17. Data are aggregated over three years to provide sufficient numbers to support reporting at the local level. The number of hospitalisations and the summed population over three years are used to provide an average rate. This is comparable to a rate based on data collected over one year.

Because a record is included for each hospitalisation for the procedure, rather than for each patient, patients hospitalised for the procedure more than once in the three financial years will be counted more than once.

The analysis and maps are based on the residential address of the patient and not the location of the hospital.

Rates are age and sex standardised to allow comparisons between populations with different age and sex structures.

### Aboriginal and Torres Strait Islander identification

The identification of Aboriginal and Torres Strait Islander patients may not be accurate for all admissions, and processes for seeking and recording identification may vary among states and territories. The data shown may under-count the number of Aboriginal and Torres Strait Islander Australians hospitalised for thyroidectomy.

# Thyroidectomy

## What do the data show?

### Magnitude of variation

Over the three-year period 2014–15 to 2016–17, there were 35,166 hospitalisations for thyroidectomy, representing an average rate of 62 hospitalisations per 100,000 people aged 18 years and over (the Australian rate).

The number of hospitalisations for thyroidectomy across 327† local areas (Statistical Area Level 3 – SA3), ranged from 28 to 130 per 100,000 people aged 18 years and over. The rate was **4.6 times as high** in the area with the highest rate compared to the area with the lowest rate. The number of hospitalisations varied across states and territories, from 42 per 100,000 people aged 18 years and over in the Australian Capital Territory to 68 in New South Wales (Figures 3.22–3.25).

After the highest and lowest 10% of results were excluded and 266 SA3s remained, the number of hospitalisations per 100,000 people aged 18 years and over was 2.0 times as high in the area with the highest rate compared to the area with the lowest rate.

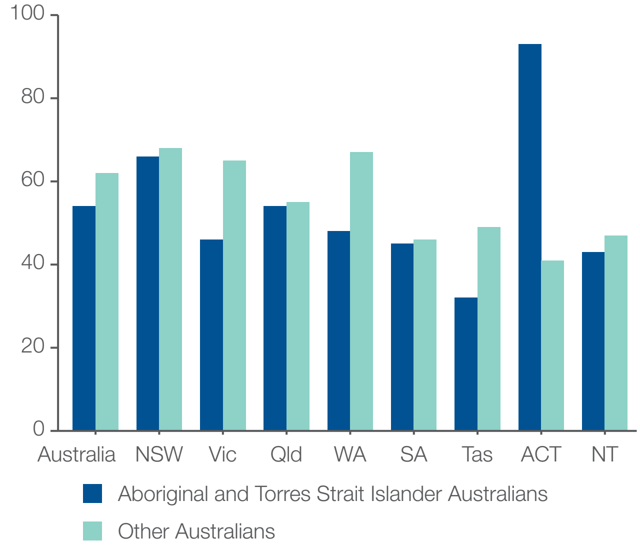
### Analysis by remoteness and socioeconomic status

Rates of hospitalisations for thyroidectomy were higher in major cities and inner regional areas than in outer regional and remote areas. Rates were higher in areas with lower socioeconomic status in major cities and in inner regional areas. However, there was no clear pattern according to socioeconomic status in other remoteness categories (Figure 3.26).

### Analysis by Aboriginal and Torres Strait Islander status

The rate of hospitalisations for Aboriginal and Torres Strait Islander Australians (54 per 100,000 people) was 13% lower than the rate for other Australians (62 per 100,000 people) (Figure 3.14).

**Figure 3.14: Number of hospitalisations for thyroidectomy per 100,000 people aged 18 years and over, age and sex standardised, by Aboriginal and Torres Strait Islander status, 2014–15 to 2016–17**




The data for Figure 3.14 are available at www.safetyandquality.gov.au/atlas

† There are 340 SA3s. For this item, data were suppressed for 13 SA3s due to a small number of hospitalisations and/or population in an area.

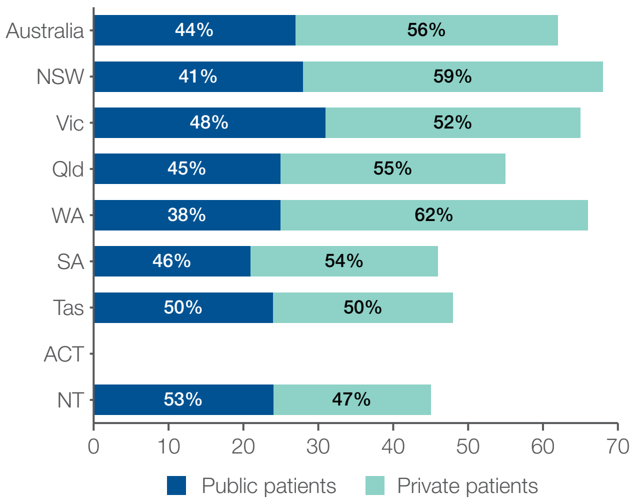
**Notes:**
Data by Indigenous status should be interpreted with caution as hospitalisations for Aboriginal and Torres Strait Islander patients are under-enumerated and there is variation in the under-enumeration among states and territories.
For further detail about the methods used, please refer to the Technical Supplement.
**Sources:** AIHW analysis of National Hospital Morbidity Database and ABS Estimated Resident Population 30 June 2014 to 2016.

## Analysis by patient funding status

Overall, 56% of hospitalisations for thyroidectomy were for privately funded patients. This proportion varied from 47% in the Northern Territory to 62% in Western Australia (Figure 3.15).

The median age at operation was 53 years for publicly funded patients and 56 years for privately funded patients.

**Figure 3.15: Number of hospitalisations for thyroidectomy per 100,000 people aged 18 years and over, age and sex standardised, by state and territory of patient residence, by patient funding status, 2014–15 to 2016–17**

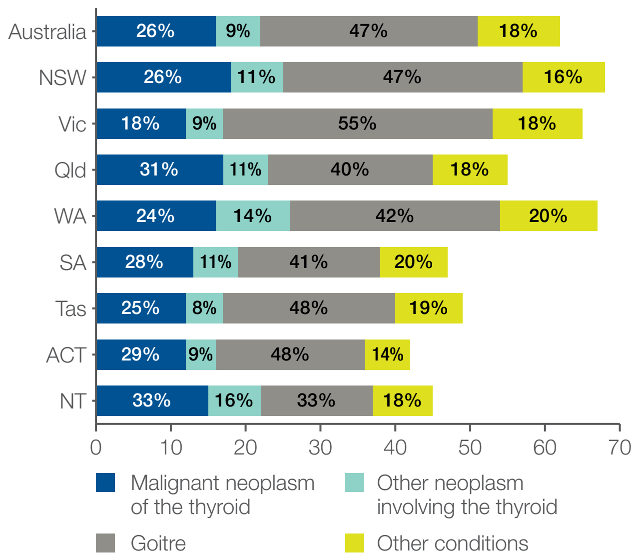



The data for Figures 3.15 and 3.16 are available at www.safetyandquality.gov.au/atlas

## Analysis by principal diagnosis

The number of hospitalisations for thyroidectomy for patients with malignant neoplasms varied across states and territories, from 12 per 100,000 people in the Australian Capital Territory, Victoria and Tasmania to 18 in New South Wales. The number of hospitalisations for thyroidectomy for patients with goitre varied from 15 per 100,000 people in the Northern Territory to 36 in Victoria (Figure 3.16).

**Figure 3.16: Number of hospitalisations for thyroidectomy per 100,000 people aged 18 years and over, age and sex standardised, by state and territory of patient residence, by principal diagnosis, 2014–15 to 2016–17**




**Notes:**
Hospitalisations for public patients do not incur a charge to the patient or a third-party payer (for example, a private health insurance fund), unlike hospitalisations for private patients.
For 2016–17, there were data quality issues related to the recording of patient funding source for patients admitted to ACT private hospitals. For this reason, 2016–17 data for ACT private hospitals are excluded from the analysis and data for the ACT are not published.
For further detail about the methods used, please refer to the Technical Supplement.
**Sources:** AIHW analysis of National Hospital Morbidity Database and ABS Estimated Resident Population 30 June 2014 to 2016.

# Thyroidectomy

## Interpretation

Variation in rates of thyroidectomy between areas may be influenced by the number of clinicians providing services to people living in the area. The practices of specific clinicians are likely to have a greater impact on rates in smaller local areas with fewer clinicians, such as rural and regional locations. Specific clinicians may influence rates across several local areas, especially those with small populations. The effects of practice styles of individual clinicians will be diluted in areas with large numbers of practising clinicians.

Variations between areas may not directly reflect the practices of the clinicians who are based in these areas. The analysis is based on where people live rather than where they obtain their health care. Patients may travel outside their local area to receive care.

Variation in rates of thyroidectomy is likely to follow on from the pattern of variation in neck ultrasound, as well as geographical differences in the factors discussed below.

### Underlying disease

Goitre was the most common reason for thyroidectomy hospitalisation in Australia. The rate of thyroidectomy for goitre was higher in Victoria than elsewhere. People in Victoria's Latrobe Valley, an area of low socioeconomic status, had a markedly higher rate of thyroidectomy hospitalisations than people living in other areas of Australia. Iodine deficiency has been a problem in some areas of Victoria in the past, but this does not appear to explain the current thyroidectomy rates seen in this area. It is possible that the history of goitre from earlier generations has sensitised clinicians to look for thyroid problems in people from this area and to refer them more readily for investigations if nodules are detected. However, such a legacy effect was not seen in Tasmania. Despite a high degree of community awareness of thyroid disease and the history of goitre in Tasmania, ultrasound and thyroidectomy rates were lower in this state than Australian averages.

### Clinical decision-making

Clinical decision-making on whether to perform thyroidectomy for low-risk thyroid papillary microcarcinomas may influence local rates. There are differences of opinion about progression to surgery for these cancers. Some guidelines recommend that active surveillance be considered rather than immediate surgery for these low-risk cancers.[1] Decisions to stage total thyroidectomy may also affect rates. Two-stage operations for the one individual would result in two hospitalisations for thyroidectomy.

### Access to services

Under-diagnosis of thyroid disease could be a contributor to the lower rates seen for Aboriginal and Torres Strait Islander Australians compared to other Australians. Poor access to services in remote areas may also disproportionately affect thyroidectomy rates for Aboriginal and Torres Strait Islander Australians because they make up proportionally more of the population in remote areas.

### Patient preference

Patient preferences about options for managing low-risk thyroid papillary microcarcinomas may differ.[31] People with better access to health care will have greater ability to opt for active surveillance, which requires regular physical examinations and ultrasounds. However, greater ability to choose treatments does not appear to explain the variation in rates seen between remoteness areas because rates of thyroidectomy were higher in major cities and inner regional areas than elsewhere.

# Neck ultrasound and thyroidectomy

## Promoting appropriate care

Understanding how much of the variation in rates of neck ultrasound represents unwarranted variation is difficult given current data capture of the MBS dataset. Strategies to ensure appropriate use of neck ultrasound and thyroidectomy in the management of thyroid cancer include:

- Improving adherence to guidelines for requesting thyroid ultrasounds
- Better capture of information on reasons for requesting neck ultrasound
- Standardised reporting of thyroid abnormalities observed at ultrasound
- Improved information for both clinicians and consumers on the relative benefits and harms of active surveillance versus immediate surgery for low-risk papillary cancers
- Improved monitoring and feedback to clinicians of information on investigation, management and outcomes of thyroid cancer.

### Improved adherence to guidelines for ultrasound requests

Optimising GP adherence to guidelines on the assessment of thyroid disease will improve the appropriateness of referrals for neck ultrasound.[7] One such initiative is the Endocrine Society of Australia's 'Do not do' recommendation for clinicians: 'Don't routinely order a thyroid ultrasound in patients with abnormal thyroid function tests if there is no palpable abnormality of the thyroid gland'.[16] As well, better GP referrals for neck ultrasound that include the reason for the imaging will aid the quality of ultrasound reporting and, in turn, guide clinical decision-making.

### Better capture of information on ultrasound requests

This Atlas has highlighted a number of limitations of current data collections for ensuring the appropriateness of thyroid investigations and management across Australia. The data showed lower rates of neck ultrasound and thyroidectomy in rural areas than in urban areas, but the significance of this on patient outcomes is unclear. Linking thyroid ultrasound use with thyroid cancer incidence and mortality data reported at a local area level would help ensure the appropriate use of thyroid ultrasound. However, this analysis is not possible currently without improvements to data capture for thyroid ultrasound.

Improving information on GP referrals for thyroid ultrasound, such as specifying the reason for the imaging, would help improve reporting and, in turn, better guide management. As well, revising MBS items to require the reason for neck ultrasound to be specified, including differentiation between initial investigation of thyroid abnormalities and follow-up for active surveillance, would vastly improve reporting and help ensure appropriate use of neck ultrasound.

### Standardised reporting of thyroid abnormalities on ultrasound

Over the past decade, a number of standardised criteria for thyroid ultrasound reporting have been developed to support clinical decision-making and help determine the need for FNAB.[1] Examples include the American College of Radiology's Thyroid Imaging, Reporting and Data System (TI-RADS) and the European system, EU-TIRADs.[32] It is not yet known if use of these criteria reduces over-diagnosis and over-treatment of thyroid cancer.

# Neck ultrasound and thyroidectomy

### Improved information for clinicians and consumers on treatment options for low-risk papillary cancers

There is evidence that adverse effects are lower among patients who choose active surveillance over immediate surgery for low-risk thyroid papillary microcarcinomas.[33] However, Australian qualitative research found that a sample of clinicians were generally not comfortable offering active surveillance, as they did not feel that the evidence was strong enough to support this approach.[34] A sample of Australian patients diagnosed with thyroid papillary microcarcinomas were also not comfortable with the idea of active surveillance, preferring surgery in order to remove their anxiety about the cancer diagnosis.[31] Further research to identify which thyroid cancers are not likely to cause harm may increase the acceptability of active surveillance.

Patients with low-risk thyroid papillary microcarcinomas should be given clear information about all their options for management, including the option of active surveillance by a specialist (for example, having regular ultrasounds and physical examinations), so that they can choose the management approach best for them.[8,9]

### Improved data for clinicians on their management and outcomes of thyroid cancer

Initiatives to provide clinicians and health services with regular data and feedback on their practice and on outcomes of investigation and management of thyroid disease would enable undesirable variations in care to be monitored. Further investigation is needed to examine the appropriateness of neck ultrasound use across Australia for thyroid cancer management. Investigating the correlation between rates of neck ultrasound and the incidence of thyroid cancer and goitre may shed light on whether rates reflect patient need.

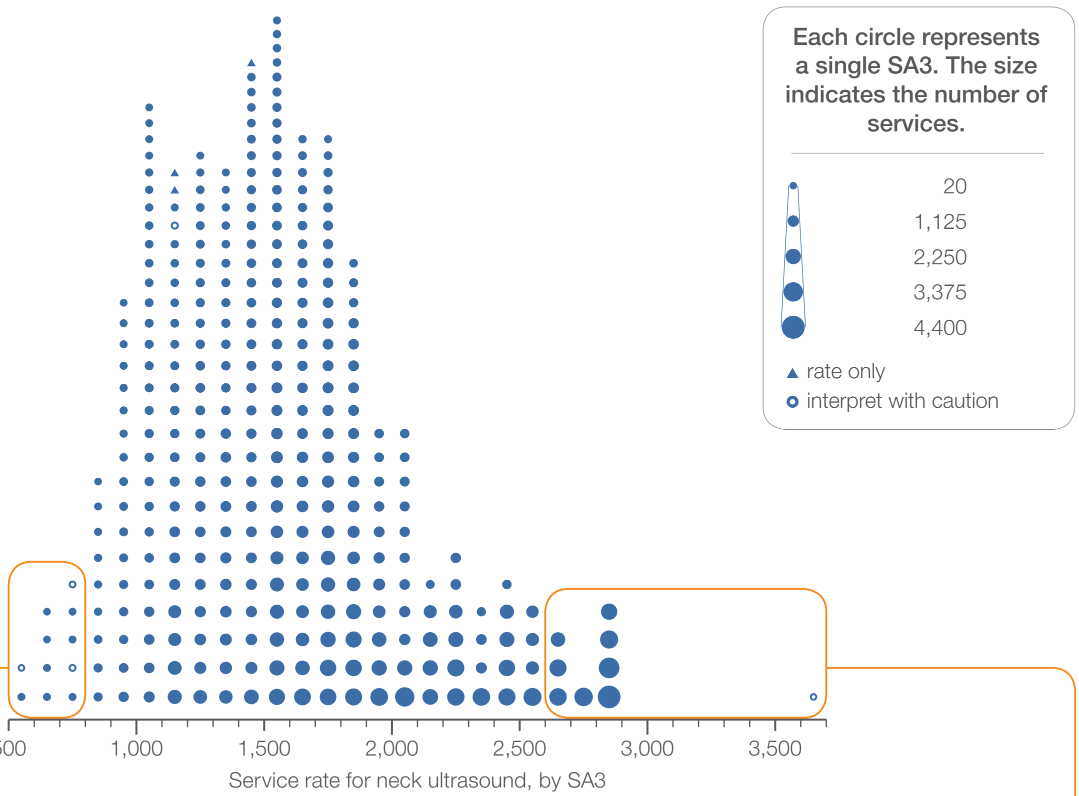
### Other strategies

A change in nomenclature to better reflect the natural history and risks of these abnormalities may also be helpful. This strategy has been used overseas in an effort to reduce the impact of diagnosis of low-risk thyroid cancers. The United States Endocrine Pathology Society changed the name of a subtype of papillary thyroid cancer in 2015, to reduce its over-treatment and psychological impact.[35] The non-invasive encapsulated follicular variant of papillary thyroid cancer was renamed 'non-invasive follicular thyroid neoplasm with papillary-like nuclear features' (NIFTP).[35] Patients with NIFTP are unlikely to benefit from total thyroidectomy and radioactive iodine therapy, and can be treated less aggressively.[35] This type of thyroid tumour has increased two- to three-fold in the past 20–30 years, and accounts for 10–20% of all thyroid cancers diagnosed in North America and Europe.[35]

# Neck ultrasound

## Rates by local area

**Figure 3.17: Number of MBS-subsidised services for neck ultrasound per 100,000 people aged 18 years and over, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2016–17**




**Lowest rate areas**

| SA3 | State | Rate | Services |
|---|---|---|---|
| Alice Springs | NT | **513** | 143 |
| Daly - Tiwi - West Arnhem | NT | **543*** | 61 |
| Esperance | WA | **618** | 78 |
| Outback - North and East | SA | **682** | 139 |
| Mid North | SA | **684** | 166 |
| Gascoyne | WA | **687** | 52 |
| Wheat Belt - South | WA | **708** | 128 |
| West Pilbara | WA | **738*** | 143 |
| Lower North | SA | **740** | 153 |
| East Pilbara | WA | **751*** | 117 |
| West Coast | Tas | **798** | 118 |

**Highest rate areas**

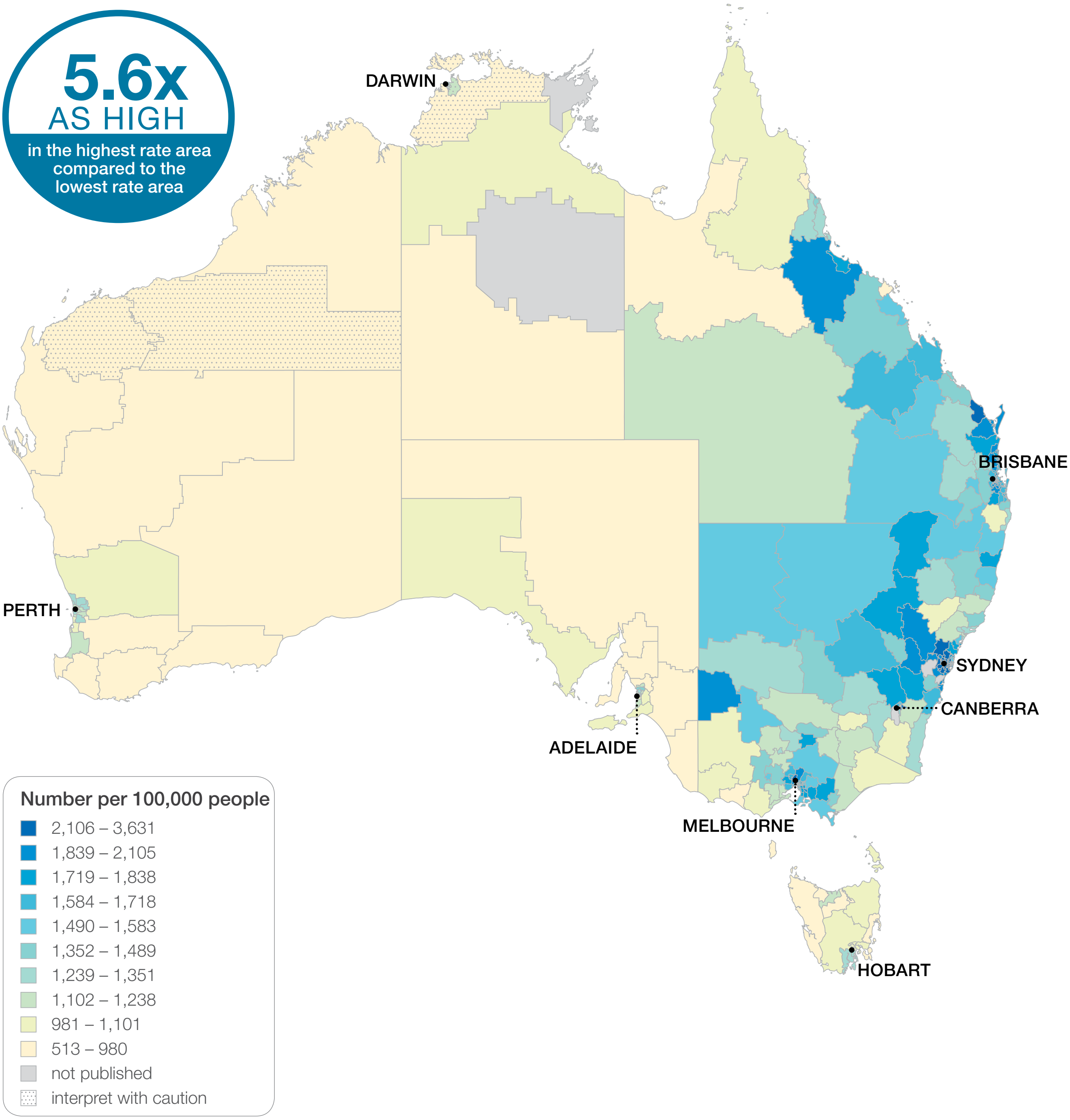
| SA3 | State | Rate | Services |
|---|---|---|---|
| Canberra East | ACT | **3,631*** | 27 |
| Fairfield | NSW | **2,893** | 4,315 |
| Canterbury | NSW | **2,861** | 3,020 |
| Liverpool | NSW | **2,858** | 2,525 |
| Bankstown | NSW | **2,835** | 3,753 |
| Merrylands - Guildford | NSW | **2,765** | 3,127 |
| Bringelly - Green Valley | NSW | **2,685** | 2,001 |
| Hurstville | NSW | **2,662** | 2,851 |
| Blacktown | NSW | **2,637** | 2,745 |

**Notes:**
Hollow circles (○) and asterisks (*) indicate rates that are considered more volatile than other published rates and should be interpreted with caution.
Triangles (▲) indicate SA3s where only rates are published. The numbers of services are not published for confidentiality reasons.
For further detail about the methods used, please refer to the Technical Supplement.
**Sources:** AIHW analysis of Medicare Benefits Schedule data and ABS Estimated Resident Population 30 June 2016.

# Neck ultrasound

## Rates across Australia

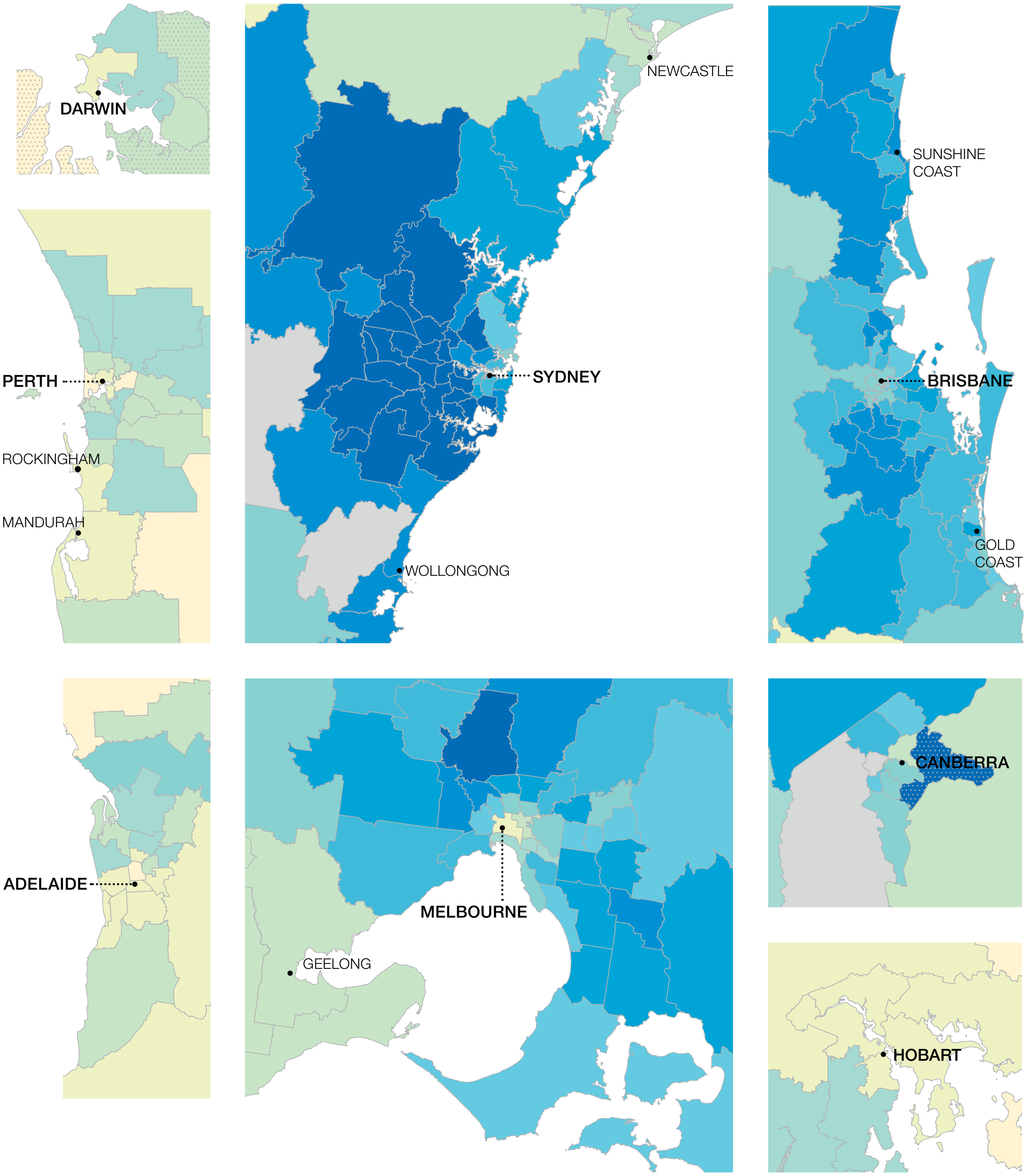
**Figure 3.18: Number of MBS-subsidised services for neck ultrasound per 100,000 people aged 18 years and over, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2016–17**




**Notes:**
Dotted areas indicate rates that are considered more volatile than other published rates and should be interpreted with caution. These rates are excluded from the calculation of the difference between the highest and lowest SA3 rates in Australia.
For further detail about the methods used, please refer to the Technical Supplement.
**Sources:** AIHW analysis of Medicare Benefits Schedule data and ABS Estimated Resident Population 30 June 2016.

## Rates across capital city areas

**Figure 3.19: Number of MBS-subsidised services for neck ultrasound per 100,000 people aged 18 years and over, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2016–17**



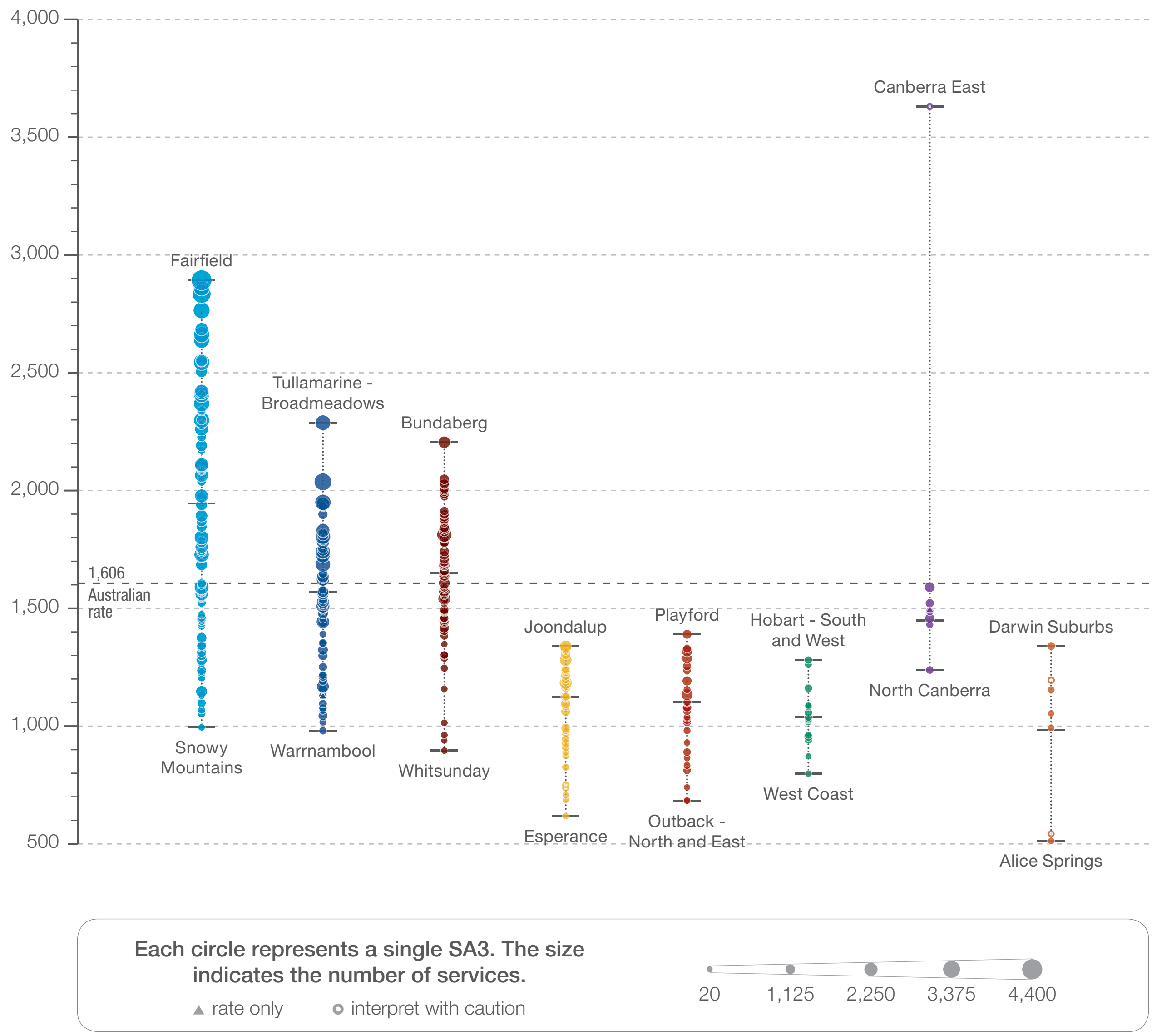

**Notes:**
Dotted areas indicate rates that are considered more volatile than other published rates and should be interpreted with caution.
For further detail about the methods used, please refer to the Technical Supplement.
**Sources:** AIHW analysis of Medicare Benefits Schedule data and ABS Estimated Resident Population 30 June 2016.

# Neck ultrasound

## Rates by state and territory

**Figure 3.20: Number of MBS-subsidised services for neck ultrasound per 100,000 people aged 18 years and over, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2016–17**

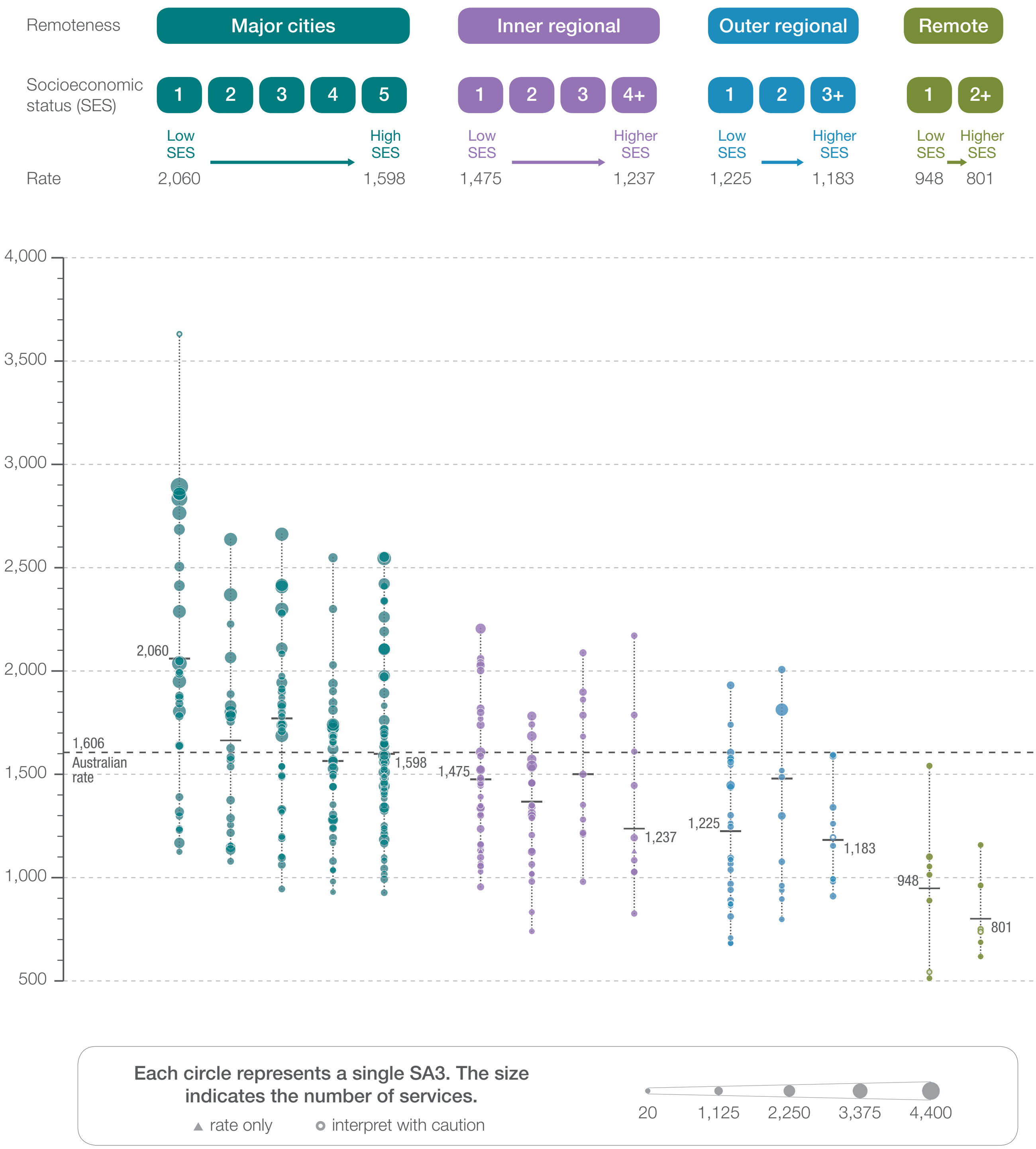
| | NSW | Vic | Qld | WA | SA | Tas | ACT | NT |
|---|---|---|---|---|---|---|---|---|
| Highest rate | 2,893 | 2,288 | 2,205 | 1,339 | 1,390 | 1,281 | 3,631* | 1,340 |
| State/territory | 1,946 | 1,570 | 1,650 | 1,125 | 1,103 | 1,037 | 1,449 | 983 |
| Lowest rate | 995 | 980 | 896 | 618 | 682 | 798 | 1,238 | 513 |
| No. services | 120,072 | 76,831 | 63,006 | 22,211 | 15,501 | 4,547 | 4,444 | 1,615 |




**Notes:**
Hollow circles (○) and asterisks (*) indicate rates that are considered more volatile than other published rates and should be interpreted with caution.
Triangles (▲) indicate SA3s where only rates are published. The numbers of services are not published for confidentiality reasons.
For further detail about the methods used, please refer to the Technical Supplement.
**Sources:** AIHW analysis of Medicare Benefits Schedule data and ABS Estimated Resident Population 30 June 2016.

# Rates by remoteness and socioeconomic status

**Figure 3.21:** Number of MBS-subsidised services for neck ultrasound per 100,000 people aged 18 years and over, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2016–17



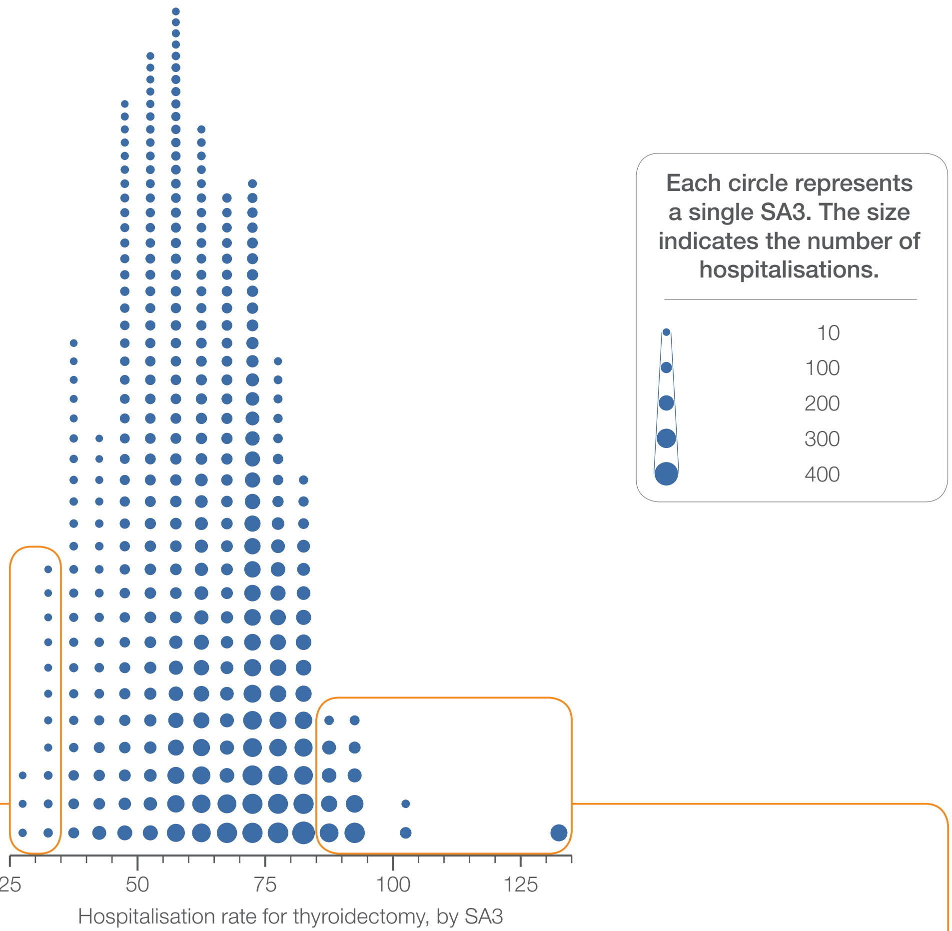

**Notes:**
Hollow circles (○) indicate rates that are considered more volatile than other published rates and should be interpreted with caution.
Triangles (▲) indicate SA3s where only rates are published. The numbers of services are not published for confidentiality reasons.
For further detail about the methods used, please refer to the Technical Supplement.
**Sources:** AIHW analysis of Medicare Benefits Schedule data and ABS Estimated Resident Population 30 June 2016.

# Neck ultrasound and thyroidectomy

# Thyroidectomy

## Rates by local area

**Figure 3.22: Number of hospitalisations for thyroidectomy per 100,000 people aged 18 years and over, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2014–15 to 2016–17**




### Lowest rate areas

| SA3 | State | Rate | Hospitalisations |
|---|---|---|---|
| Outback - South | Qld | 28 | 14 |
| Great Lakes | NSW | 29 | 30 |
| Yorke Peninsula | SA | 29 | 20 |
| Mid North | SA | 30 | 24 |
| Darwin City | NT | 31 | 19 |
| Whitsunday | Qld | 32 | 17 |
| West Coast | Tas | 32 | 14 |
| Robina | Qld | 33 | 41 |
| South Canberra | ACT | 33 | 22 |
| Weston Creek | ACT | 33 | 19 |
| Katherine | NT | 33 | 12 |
| Broadbeach - Burleigh | Qld | 34 | 55 |
| Hobart Inner | Tas | 34 | 43 |
| Upper Hunter | NSW | 34 | 24 |

### Highest rate areas

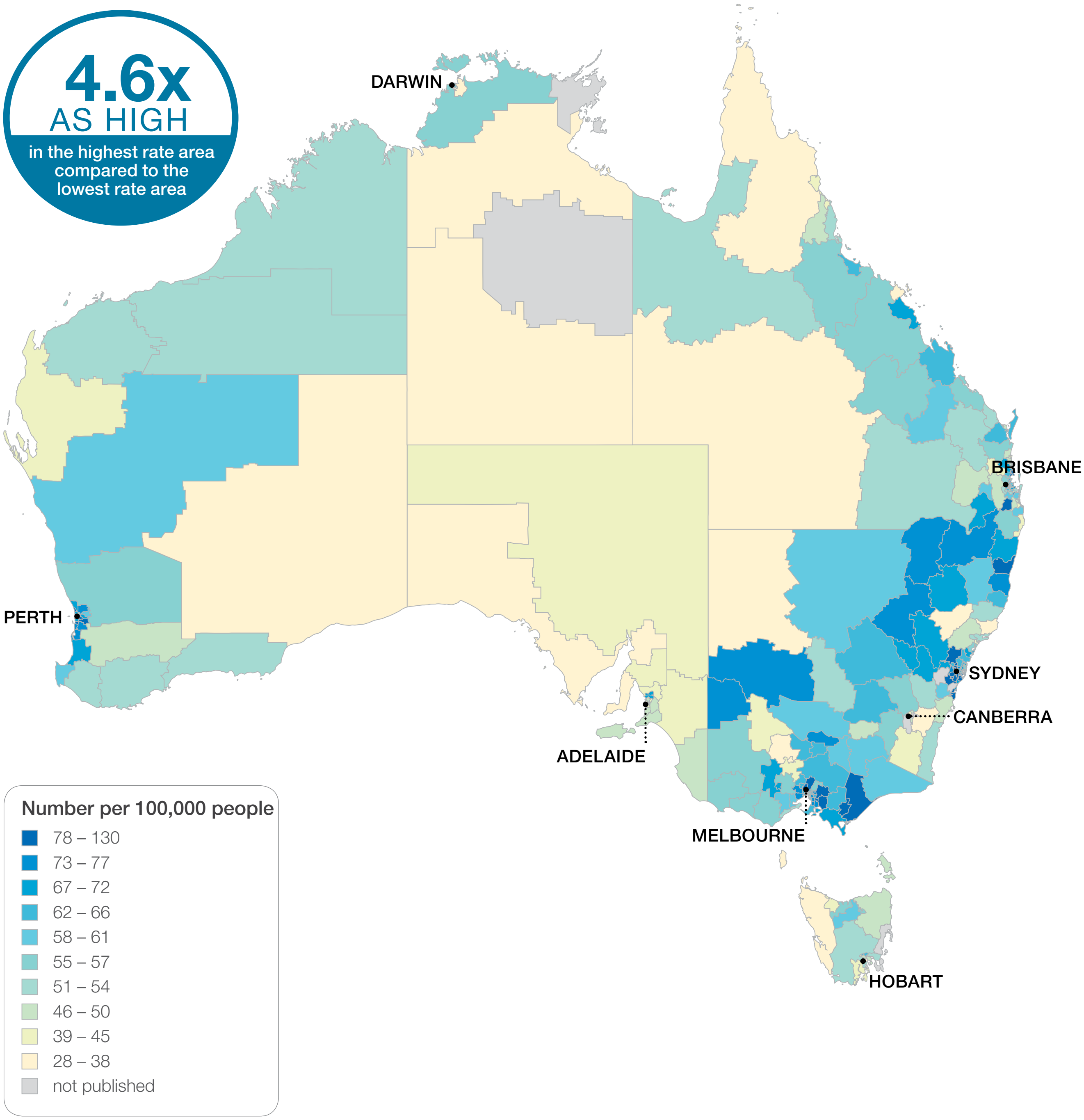
| SA3 | State | Rate | Hospitalisations |
|---|---|---|---|
| Latrobe Valley | Vic | 130 | 242 |
| Botany | NSW | 104 | 109 |
| Beaudesert | Qld | 101 | 33 |
| Campbelltown (NSW) | NSW | 92 | 325 |
| Cronulla - Miranda - Caringbah | NSW | 92 | 258 |
| Blacktown - North | NSW | 91 | 169 |
| Kwinana | WA | 91 | 69 |
| Camden | NSW | 90 | 119 |
| Rouse Hill - McGraths Hill | NSW | 89 | 57 |
| Dapto - Port Kembla | NSW | 88 | 166 |
| Liverpool | NSW | 87 | 224 |
| Kogarah - Rockdale | NSW | 86 | 286 |
| Bringelly - Green Valley | NSW | 86 | 184 |

**Notes:**
For further detail about the methods used, please refer to the Technical Supplement.
**Sources:** AIHW analysis of National Hospital Morbidity Database and ABS Estimated Resident Population 30 June 2014 to 2016.

# Thyroidectomy

## Rates across Australia

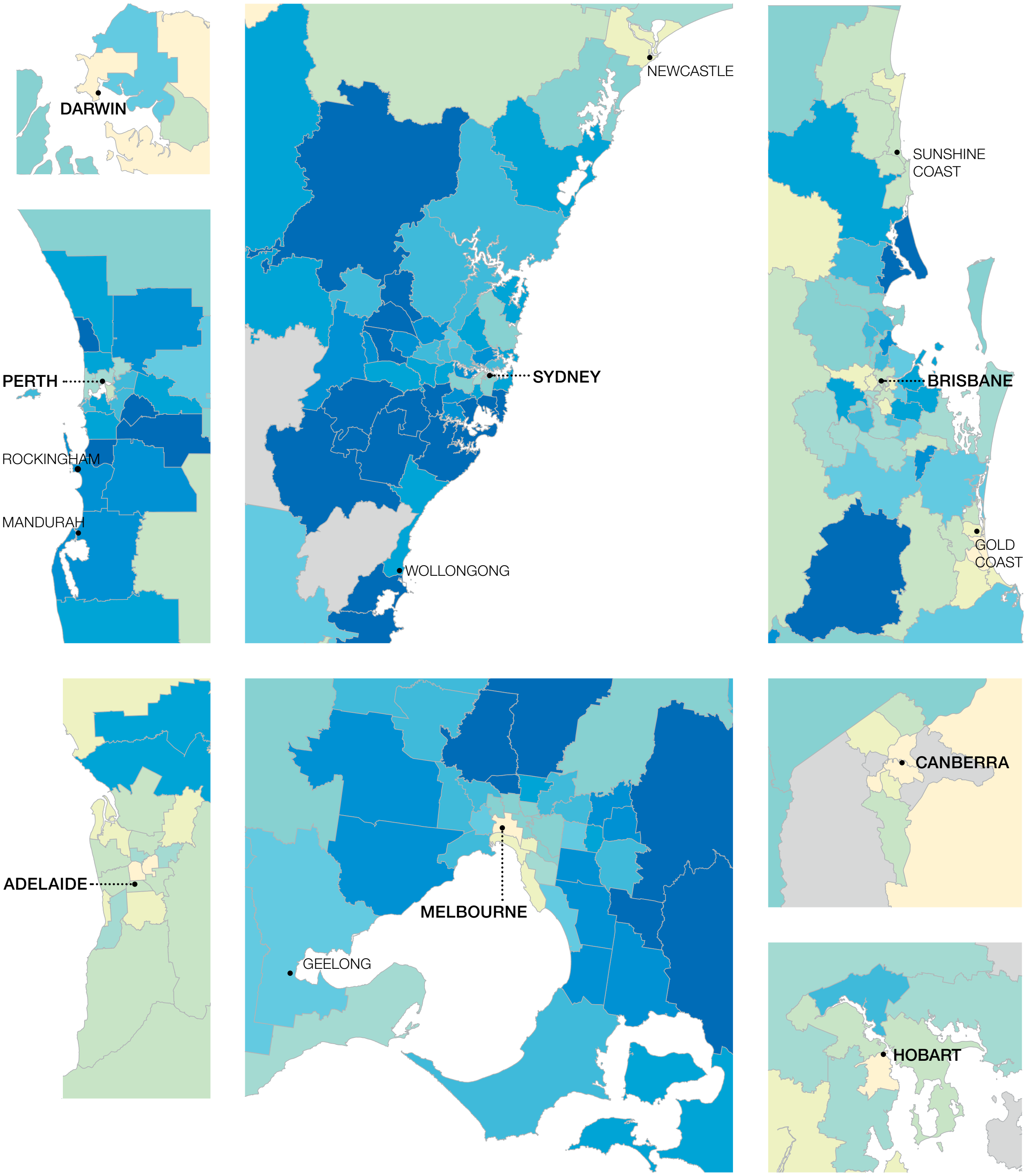
**Figure 3.23: Number of hospitalisations for thyroidectomy per 100,000 people aged 18 years and over, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2014–15 to 2016–17**




**Notes:**
For further detail about the methods used, please refer to the Technical Supplement.
**Sources:** AIHW analysis of National Hospital Morbidity Database and ABS Estimated Resident Population 30 June 2014 to 2016.

## Rates across capital city areas

**Figure 3.24:** Number of hospitalisations for thyroidectomy per 100,000 people aged 18 years and over, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2014–15 to 2016–17



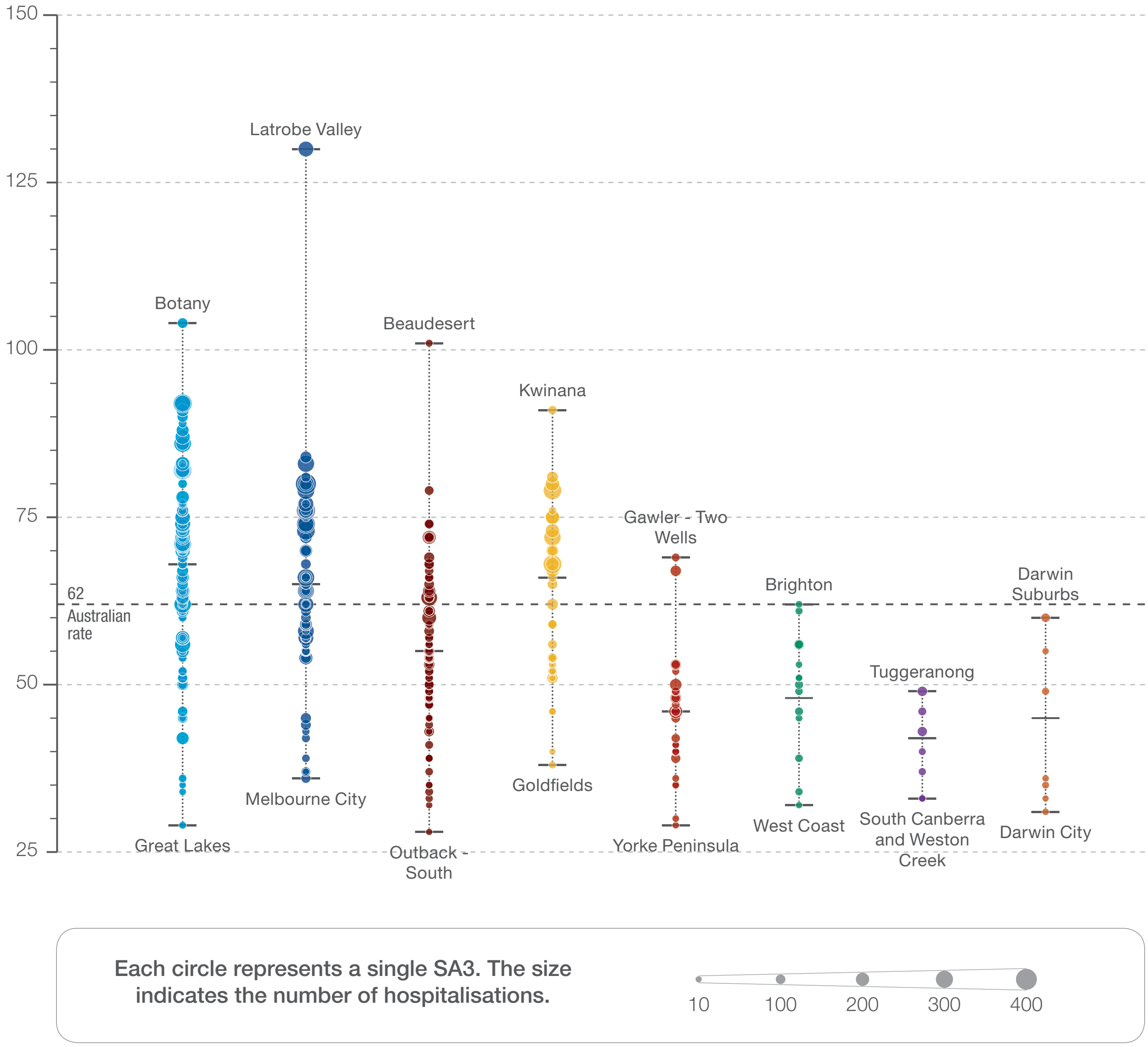

**Notes:**
For further detail about the methods used, please refer to the Technical Supplement.
**Sources:** AIHW analysis of National Hospital Morbidity Database and ABS Estimated Resident Population 30 June 2014 to 2016.

# Thyroidectomy

## Rates by state and territory

**Figure 3.25: Number of hospitalisations for thyroidectomy per 100,000 people aged 18 years and over, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2014–15 to 2016–17**

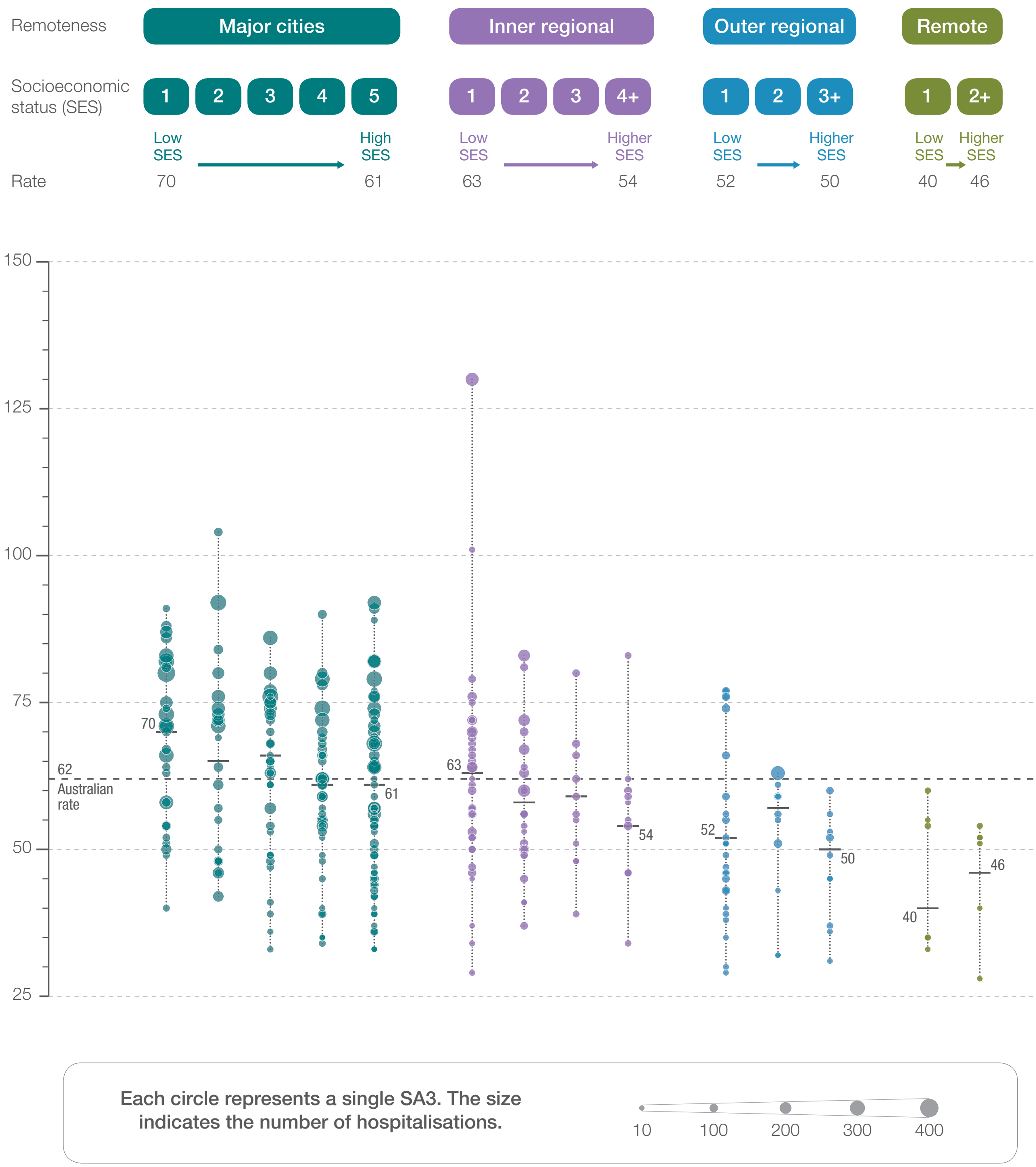
| | NSW | Vic | Qld | WA | SA | Tas | ACT | NT |
|---|---|---|---|---|---|---|---|---|
| Highest rate | 104 | 130 | 101 | 91 | 69 | 62 | 49 | 60 |
| State/territory | 68 | 65 | 55 | 66 | 46 | 48 | 42 | 45 |
| Lowest rate | 29 | 36 | 28 | 38 | 29 | 32 | 33 | 31 |
| No. hospitalisations | 12,485 | 9,388 | 6,217 | 3,879 | 1,926 | 621 | 380 | 222 |




**Notes:**
For further detail about the methods used, please refer to the Technical Supplement.
**Sources:** AIHW analysis of National Hospital Morbidity Database and ABS Estimated Resident Population 30 June 2014 to 2016.

## Rates by remoteness and socioeconomic status

**Figure 3.26:** Number of hospitalisations for thyroidectomy per 100,000 people aged 18 years and over, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2014–15 to 2016–17




**Notes:**
For further detail about the methods used, please refer to the Technical Supplement.
**Sources:** AIHW analysis of National Hospital Morbidity Database and ABS Estimated Resident Population 30 June 2014 to 2016.

# Neck ultrasound and thyroidectomy

## Resources

- British Thyroid Association guidelines for the management of thyroid cancer, 3rd edition[14]
- American Thyroid Association management guidelines for adult patients with thyroid nodules and differentiated thyroid cancer[1]
- *Therapeutic Guidelines: Endocrinology*[36] (for electronic version, visit http://tgldcdp.tg.org.au/etgcomplete)
- Cancer Council of Australia, *Understanding Thyroid Cancer: A guide for people with cancer, their families and friends*.[37]

## Australian initiatives

The information in this chapter will complement work already under way to improve the management of thyroid cancer in Australia. At a national level, this work includes:

- Australia and New Zealand Thyroid Cancer Registry, Monash University, established 2017[11]
- Endocrine Society of Australia, Choosing Wisely recommendation 1: Don't routinely order a thyroid ultrasound in patients with abnormal thyroid function tests if there is no palpable abnormality of the thyroid gland.[16]

Many state and territory initiatives are also in place to improve management of thyroid cancer, including:

- WA Cancer and Palliative Care Network, *Thyroid Cancer Model of Care*[38]
- Tasmanian Ministerial Thyroid Advisory Committee (established in the 1970s) – leads advocacy for thyroid research informing public health policy
- Tasmanian Health Pathways – provides advice in line with the Endocrine Society of Australia's Choosing Wisely recommendations
- Queensland Health Clinical Prioritisation Criteria – provide guidance to GPs on referral requirements for specialist hospital care for thyroid enlargement or nodules (https://cpc.health.qld.gov.au/Condition/222/thyroid-enlargement-thyroid-nodules and https://cpc.health.qld.gov.au/Condition/69/thyroid-mass).

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